THE EFFECTS OF NEIGHBORHOOD ENVIRONMENTS ON THE LEVEL OF PHYSICAL ACTIVITY AMONG OLDER AFRICAN AMERICAN WOMEN IN TEXAS

A Dissertation

by

WOO HWA SHIN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2008

Major Subject: Urban and Regional Sciences

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ABSTRACT

The Effects of Neighborhood Environments on the Level of Physical Activity among Older African American Women in Texas. (August 2008)

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The older African American women living Texas fall into one of the most inactive population segments. Recently, the importance of socio-ecological models on human health behavior and more complex associations between variables have been discussed. Therefore, this cross-sectional study focuses on investigating the trends in physical activity among older African American women, exploring the effects of actual environmental variables that might encourage or discourage their physical activity, and discovering any plausible mediating effects between environmental factors and older African American women's physical activity.

The study sample is composed of African American women aged 55 to 84 who reside in independent housing in Bryan, Texas. A total of 282 older African American women's addresses were systematically selected and a self-administrated survey questionnaire documenting the level of physical activity, psychological well-being, sense of community, perception of safety, physical health status, and background information

was collected for each of the women. The environmental influences of natural and built environments were defined using two boundaries: 1) nearby home level (0.5 mile street distance), and 2) neighborhood level (1 mile street distance) from the participant's house. The natural and built environments were measured using a Geographic Information System (GIS) and aerial photographs.

Results showed that a) walking was the most prevalent type of physical activity and streets were the most popular places for older African American women; b) at the nearby home level, greenery and land use mixture were positively associated with older African American women's physical activity while street pattern and access to commercial areas influenced their physical activity at the neighborhood level; and c) perceptions of crime-related neighborhood problems had significant mediating effects decreasing older African American women's physical activity. The findings revealed that the environmental variables had a distance effects on older women's physical activity. In addition, on a policy level, neighborhood problems should be dealt with using careful insight in order to encourage physical activity.

DEDICATION

To my love Woo-Jin and Jun-Soo

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First of all, I would like to give all glory to God from the beginning of this study to the end. God has always been with me in every difficult and joyful minute and guided me as I worked toward my Ph.D. degree.

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CHAPTER I

INTRODUCTION

1.1 Background of the Study

Recently, the older people's population is rapidly growing in the United States. By the year 2030, Americans age 65 or older are expected to number 70 million, roughly 20% of the U.S. population. Also, people aged 85 years and older are noticed as the fastest growing segment of the population expecting to be increased to approximately 17.7 million from 3.1 million in 1990 (National Institute on Aging (NIA), 2000; Federal Interagency Forum on Aging Related Statistics (FIRARS), 2000) (See Figure 1-1).

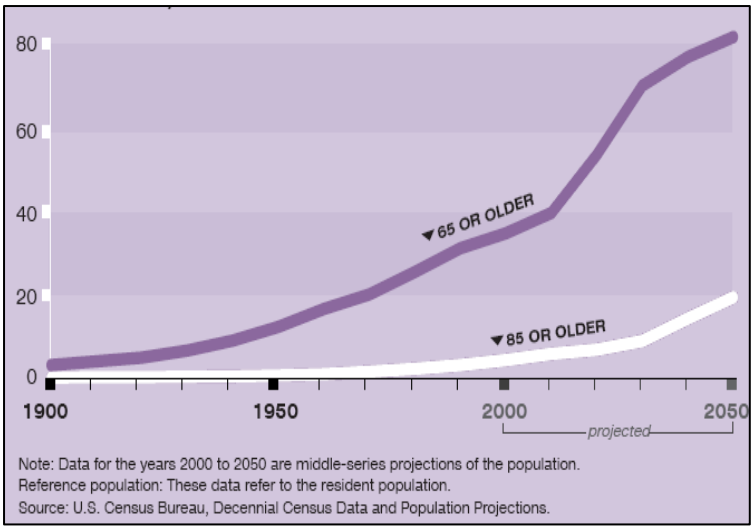


Figure 1-1 Number of Persons Age 65 or Older from 1990 to 2050

Source: National Institute on Aging (NIA), 2000

This dissertation follows the style of *Environment and Behavior*.

Such a rapid increase in the elderly population also raises concerns regarding an increasing number of older obese Americans. In 2000, obesity prevailed among 14.6 million Americans age 60 and older – representing about 32% of the nation's total elderly. Under the worst-case estimates, the number of obese older Americans is expected to reach 22.2 million, or 39.6 % of the elderly population, by 2010 (Arterburn et al., 2004).

As one way to reduce and prevent obesity, physical activity is widely suggested and emphasized. The evidence that physical activity is associated with lean body mass increases, long-tem weight loss, and reducing obesity and overweight has been shown in related literature (Blair & Brodney, 1999; Di Francesco et al., 2005; Kayman et al., 1990; Sidney et al., 1977). Also, national programs such as The Nutrition and Physical Activity Program to Prevent Obesity and Other Chronic Diseases (NPAO) currently help develop physical activity intervention to reduce the prevalence of obese Americans throughout the funded states (Hamre et al., 2005).

The benefits of physical activity for elderly adults include improving mobility and function, increasing life expectancy, reducing health-related financial burdens, and helping people to enjoy independent lifestyles (Butler et al., 1998; U.S. Department of Health and Human Services (U.S. HHS), 1996; National Institute on Aging (NIA), 2000; Feldman, 2003; Fiatarone, 1996; Scholes, 1991). Recognizing the importance of physical activity, Healthy People 2010 set objectives for reducing the proportion of older adults who are not engaged in leisure-time physical activity from 51% (aged 65-74) and

65% (aged over 75) to 20% (U.S. Department of Health and Human Services (U.S. HHS), 2000).

The American College of Sports Medicine (ACSM) and American Heart Association (AHA) recently updated the physical activity recommendations for older adults aged 65 and over (retrieved April 18, 2008 from http://www.acsm.org/AM/Template.cfm?Section=Home_Page&TEMPLATE=/CM/HTMLDisplay.cfm&CONTENTID=7764; Nelson et al., 2007). The general recommendations of this updated Physical Activity & Public Health Guidelines (2007) are similar to those of 1995, which advises participation in at least 30-minute of moderately intense activity at least five days a week and encourages walking as a good source for the moderate intensity physical activity. Basic recommendations for adults over 65 were newly added, emphasizing the importance of doing aerobic exercise and strength training.

1.2 Statement of the Problem

Healthy People 2010 defines the at risk populations for physical inactivity as women, those with lower incomes, less educated persons, African Americans, Hispanics, and those living in southern states (U.S. Department of Health and Human Services (U.S.HHS), 2000). Elderly population are also revealed as one of most sedentary segments, indicating that about 23.1% and 35.9 % of those ages 65 to 74 and 75 or older are not engaged in any leisure-time, household, or transportation physical activity (Centers for Disease Control and Prevention (CDC), 2001) (See Figure 1-2).

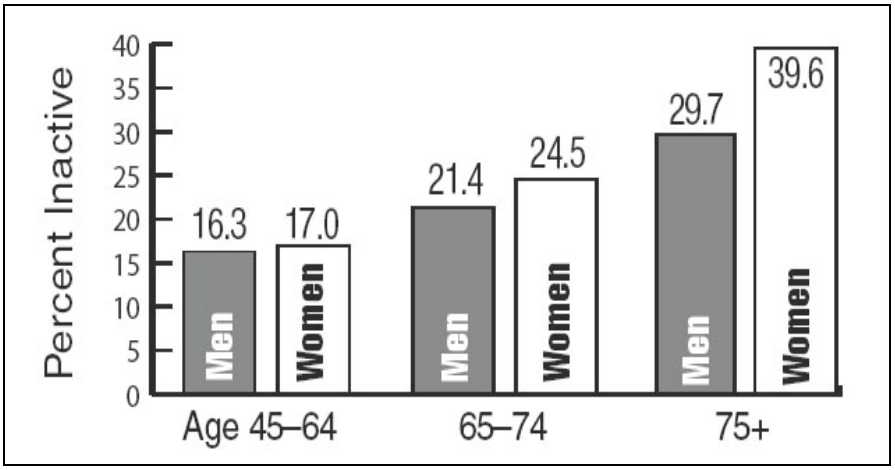


Figure 1-2 Prevalence of Physically Inactive US Older Adults Based on BRFSS, 2001

Source: Centers for Disease Control and Prevention, 2001

Among older adults age 75 or older, gender and racial/ethnic health disparities stand out conspicuously. Physical inactivity among African American women age 75 or older shows the highest percentage (61%) compared the same age group of white women (47.4%) and African American men (59.2%) (Rejeski & Brawley, 2000). National data also show that obesity for persons age 65 and over is more prevalent among those who live in Texas (22.5%) than the nationwide incidence (19.4%) (Centers for Disease Control and Prevention (CDC), Trends Data, Retrieved May 1, 2007 from http://apps.nccd.cdc.gov/brfss/Trends/agechart_c.asp?qkey=10010&state=US&state_c=TX&grouping=1).

The interest and the need to focus on seniors' physical activity have led to the identification of variables that contribute to promoting regular physical activity. Prior research has found that that demographic factors (e.g. education, gender, marital status), psychological factors (e.g. self-efficacy, pros and cons to exercise, religious-well being),

and social support or social networks are significantly associated with senior's physical activity (Guinn & Vincent, 2002; Green & Ottoson, 1999; Coleman, 1993; Rakowski & Mor, 1992; Schoenfeld et al., 1994; Wilcox et al., 2003). Also, loss of functions and chronic diseases (e.g. arthritis, diabetes, cardiovascular disease, obesity and high blood pressure) have been found as major barriers for older adults to be physically active (Centers for Disease Control and Prevention (CDC), 2001).

Recently, as social-ecological models raise the needs for studies on the environmental influence on health behavior (McLeroy et al., 1988; Sallis & Owen, 2002), a variety of environmental variables associated with physical activity among the general adult population have been discovered. The efforts for examining the environmental effects among different ethic-groups of older women found that the environmental factors were differently presented among ethic-groups (King et al., 2000; Wilcox et al., 2000; Wilcox et al., 2003). Yet, a review of environmental influences on physical activity specific to older populations has been extremely limited with perceptions on a few environmental characteristics and has generally been less conclusive (Fisher et al., 2004; King et al., 2000; King et al., 2003;Wilcox et al., 2000; Wilcox et al., 2003). Moreover, while the gaps between people's perceptions of their environment and reality do exist (Kirtland et al., 2003), the influence of objectively measured physical environments on senior's physical activity and walking has rarely been investigated. Consequently, measuring the physical environments in which older adults live using Geographic Information System (GIS) and examining its impacts on physical activity is needed to assess environmental interventions in objective ways.

In addition, a few current studies have addressed new statistical approaches to understand variables that influence physical activity. These studies address the need for more research to identify the role of variables as moderators, mediators, or confounders, which could help to improve physical activity (Bauman et al., 2002; Baranowski et al., 1998; Masse et al., 2002; MacKinnon et al., 2002).

Noting that older African American women are one of the most physically inactive subgroups, more effort and attention to identifying factors that influence their physical activity should be provided. Compared to the studies about individual and social aspects affecting physical activity, the effect of either perceived or actual physical environments on older African American women's physical activity have rarely been conducted. Therefore, this study will examine how objectively measured environments influence older African American women's participation in physical activity and discover any plausible mediating effects between environmental factors and older African American women's physical activity.

CHAPTER II

LITERATURE REVIEW

2.1 Theoretical Rational: Environment and the Elderly

Recognitions of the importance of physical activity have fostered a variety of research for identifying factors that influence on both sedentary life-style and physical activity. As Lewin (1935) described, “there is nothing so useful as a good theory”, theories in field of health behavior help professionals define the scope of practice and research during various stages of planning, implementing and evaluating the change of health behavior (Glanz et al., 2002).

In health behavior research and practice, multitude of theories, instead of single theory, has been addressed and applied to explain and promote health behavior change. Several studies attempt to apply health-related theories in substantiating factors and its relationships that affect physical activity. Theories and models related to health behaviors, ranged from individual level to environmental level, have been tested and evaluated in researches on physical activity.

2.1.1 Press-Competence Model (Ecological Model of Aging)

It is apparent that biological and physiological changes in the aging process have a tendency to cause a decline in older adults’ mobility, weak resistance to diseases, and a loss of functional ability (e.g. visual impairment, and the ability to reach things at ground

level or above head height) (see Table 2-1), which results in in older adults to be physically inactive (Stoneham & Thoday, 1994; Burbank & Riebe, 2002).

Table 2-1

Physiological Changes Associated with Aging

- Aerobic capacity decreases by 10% per decade
- Pulmonary function decreases
- Percentage of body fat increases
- Muscular strength is reduced
- Muscle mass is substantially reduced
- Bone mass decreases
- Size and number of muscle fibers decrease
- Maximal stroke volume decreases
- Maximal cardiac output decreases
- Movement time and reaction time decreases

Points to Remember:

- With aging, there is a natural deterioration in physiological function. This decline is compounded by the fact that aging is often accompanied by a sedentary lifestyle.
- Regular exercise appears to slow age-related decrements in physiological function.
- Research indicates that older adults adapt to exercise. They have the ability to increase cardiovascular endurance, muscular strength, and flexibility.

Source: Burbank & Riebe, 2002

Lawton and Nahemow (1973) developed the Press-Competence Model (Ecological Model of Aging) where the adaptive behavior or/and positive affect was schematically represented as the outcome of the transaction between environmental press and individual competence (see Figure 2-1). In the model, competence was defined in the domain of "biological health, sensorimotor functioning, cognitive skill, and ego strength" (Lawton, 1972). The term environment was classified with four

levels; that is, personal environment, suprapersonal environment, social environment, and physical environment (Lawton, 1970). In the model, environment was characterized as the demands or stimulus of a context in which a person behaves.

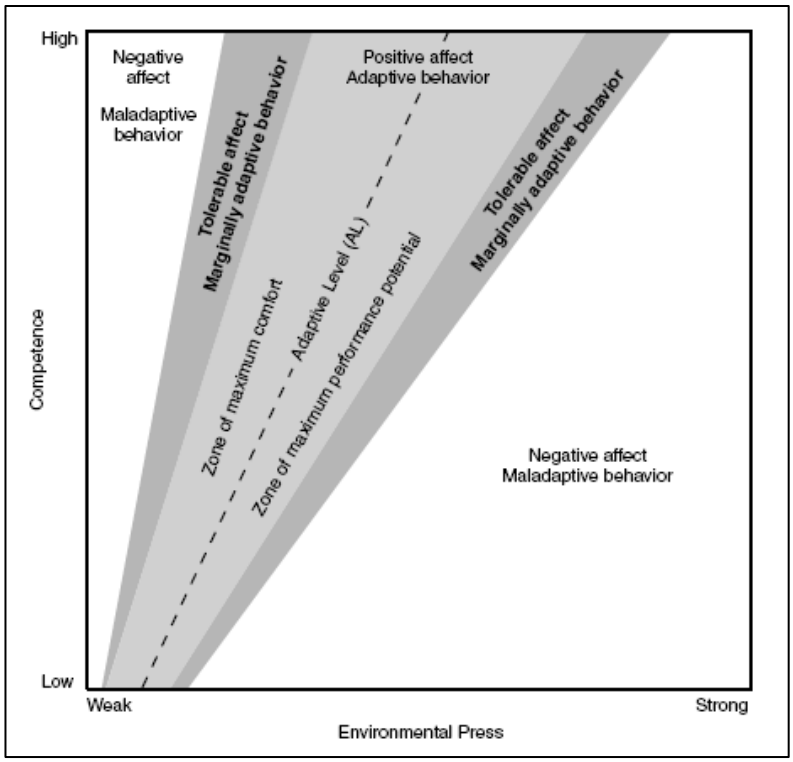


Figure 2-1 Press-Competence Model (Ecological Model of Aging)

Source: Lawton, M. P. (1980). Environment and Aging.

The figure of Ecological Model of Aging presented that older adults have more competences have wider comfort/performance ranges, and those who with less competence can be affected by very small changes in environmental demands. In other words, deteriorations in physical function by way of aging might lead older adults to be more prone to the effects of environmental settings because of the gap between the level

of competence of the elderly and the environmental demands. A study result that elder adults react more sensitively to environmental settings than younger people (Lawton & Simon, 1968) provided a good example of the relevance between aging and the Model.

2.1.2 Ecological Models

In health behavior-related research, a multitude of theories and models, as opposed to one single theory, are often discussed because each theory or model constructs and variables at different levels ranging from the individual to the environmental level. In recent publications, the importance of ecological perspectives on health behavior is widely recognized as useful method in health promotion (Sallis & Owen, 2002). Ecological models have been developed based on several historical traditions of ecological approaches to human behavior within psychological field. Since 1953 Skinner firstly addressed that causation of behavior arises not only from individual level but also from observable environment, several researchers have been focused on defining various types of environment and their influences on behavior change. For example, Urie Bronfenbrenner (1979) described that behavior is affected by three levels of environment which are the microsystem, the mesosystem, and the exosystem. Within social ecological model of health behavior that developed by Rudolph Moos (1980), the categories of environment was more specified and subdivided into physical setting, organizational, human aggregate, and social climate, although his work is likely to have a leaning towards the various types of social environment.

With previous trends beginning to consider the influence of environment on health-related behavior, Ecological Models were proposed by McLeroy, Bileau, Steckler, and Glanz in 1988 where the importance of environmental factors is emphasized in ecological models. McLeroy et al.(1988) clarified that "the purpose of an ecological model is to focus attention on the environmental causes of behavior and to identify environmental interventions." Ecological models are distinguished from other models and theories by addressing multilevel influences on health behavior. Five levels that are identified in ecological models are: (1) intrapersonal, or individual factors; (2) interpersonal factors; (3) institutional, or organizational factors; (4) community factors; and (5) public policy factors. (see Table 2-2).

Table 2-2

The Definitions of Multilevel in Ecological Models

Concept	Definition
Intrapersonal Factors	Individual characteristics that influence behavior, such as knowledge, attitudes, beliefs, and personality traits
Interpersonal Factors	Interpersonal processes, and primary groups including family, friends, peers, that provide social identity, support, and role definition
Institutional Factors	Rules, regulations, policies, and informal structures, which may constrain or promote recommended behaviors
Community Factors	Social networks and norms, or standards, which exist as formal or informal among individuals, groups, and organizations
Public Policy	Local, state, federal policies and laws that regulate or support healthy actions and practices for disease prevention, early detection, control, and management

Source: Theory at-a-glance: a guide for health promotion practice, U.S. Department of Health and Human Services, 1996

In addition, as MacIntyre and Ellaway (2000) posed the need to new multilevel analytical approaches, appropriate multilevel statistical analysis would be helpful for better understanding interactions between multilevels and their influences on health promotion. However, due to a lack of specificity at each level, it is suggested that ecological models need to be enhanced by integrating each level with other models.

2.2 Natural Environmental Influences on Senior's Physical Activity

Strong empirical evidence supports the benefits of natural elements (e.g. vegetation, trees, etc.) or natural settings for restorative effects, increasing social interaction, reducing fear of crime, reducing drivers' anger, frustration, and fatalities, and increasing the perception of pedestrian safety (Cackowski & Nasar, 2003; Kaplan, 1995; Kuo & Sullivan, 2001; Kweon et al., 2004; Mok, 2003; Ulrich, 1984; Ulrich et al., 1991). The literature on elderly adults has found an important role of nature in terms of increasing the level of psychological well-being, longevity, social interaction, sense of community, and reductions in blood pressure (Kweon et al, 1998; Orsega-Smith et al, 2004; Talbot & Kaplan, 1991; Takano et al, 2002). Regarding to senior's physical activity, the actual size of green spaces and the accessibility to various nature-related facilities were found as influential variables.

2.2.1 Perceived/Objective Natural Environmental Characteristics

Findings have suggested that when older adults perceive enjoyable scenery in the neighborhood they are more physically active. (Booth et al, 2000; Wilcox, 2000)

Another study showed that the total green and open spaces for recreation as measured by GIS, both within 0.5 mile radius from the respondent's home and at the neighborhood level, increased senior's physical activity and walking (Li et al., 2005).

2.2.2 Access to Nature-Related Facilities

Having the perceived access to, and a greater number of nature-related facilities was found to be associated with physical activity among older populations. A study on older Australians over 60 reported that those who perceived having access to a recreation center (i.e. cycle tracks, golf courses, parks, or swimming pools) were more likely to engage in physical activity, though this was not true for exercise halls, gyms, tennis courts, or bowling greens. (Booth et al., 2000) Older women who perceived that biking or walking trails, or parks located within 20 minute-walking distance from their homes showed significantly higher levels of pedometer walking records than those who did not have such facilities. (King et al., 2003) Another study found that when older adults perceived a greater number of facilities among 11 listed local recreational facilities (e.g. gym/fitness centers, public parks, trails, etc.) within 0.5 mile radius of participant's home they were more likely to engage in physical activity and walking. (Li et al., 2005)

The actual area and location of nature-related facilities also affects elderly adults' physical activity and walking. Older residents who live in neighborhoods having higher proportions of facilities for walking (i.e. trails, parks, and paths per neighborhood acre) were more likely to engaging in physical activity and walking. (Fisher et al., 2004) Golf courses located within a 1500-meter distance along the streets from older woman's

houses were associated with more walking as measured by pedometers. (King et al., 2005)

2.3 Built Environment and Seniors' Physical Activity

There is a growing believes that the physical environment that we live in drives physical activity behaviors and ultimately public health. A number of studies focusing on general adult population recently have been tried to connect physical environment with physical activity and walking and biking behaviors. According to these studies, physical activity and walking and biking behaviors are affected by land use mix, density, distance to/from destinations, street patterns, sidewalk connectivity, and neighborhood view or attractiveness landscaping (Cervero & Duncan, 2003; Handy, 1996; Giles-Corti & Donovan, 2003; Rodriguez & Joo, 2004; Saelens et al., 2003).

In only a few studies, built environmental factors that influence senior's physical activity were investigated focusing on access to services, conveniences, public facilities, and neighborhood characteristics in both perceived and objective ways.

2.3.1 Access to Services/Conveniences/Public Facilities

One study found that older women who perceived department, discount, or hardware stores being located within a 20 minute-walking distance showed significantly higher levels of pedometer recorded walking than those who did not have such facilities (King et al., 2003). Later on King and colleagues (2005) defined the street distance of 1,500m from participant's houses as the neighborhood boundary of the 20 minute-

walking distance using GIS, and examined the impacts of locations of conveniences on older women's walking behaviors. From the study, only post offices located within walking distance were revealed as being associated with walking records as measured by pedometer. Patterson and Chapman (2004) suggested that the urban form designed by new urbanism guidelines led residents to walk more to community services although the perceived distances to the services were similar between differently designed neighborhoods.

2.3.2 Perceived/Objective Built Environmental Characteristics

With research on the elderly, the perceived environmental impacts on physical activity were limited with questions regarding the presence of sidewalks, hills, street lights, and unattended dogs (Booth et al., 2000; King et al., 2000; Wilcox et al., 2000; Wilcox et al., 2003). Among those studies, the perception to absence of sidewalks/footpath was associated with older adults' walking or physical activity (Booth et al., 2000; Patterson & Chapman, 2004; Wilcox et al., 2003). Another study found that the perceived presence of hills influenced a higher level of physical activity among older white and Hispanic women (King et al., 2000). Li and colleagues (2005) measured actual environmental characteristics using GIS, and found that the number of street intersections was significantly related to senior's walking and physical activity at the neighborhood level.

2.4 Mediators between Physical Environment and Seniors' Physical Activity

Previous studies found that psychological well-being, sense of community, and perceptions to neighborhood safety (i.e., neighborhood problems, crime safety, and traffic safety) were associated either with natural or built environments, or with seniors' or general adults' physical activity. In this study, the possibility of these factors as mediators between physical environments and older African American women's physical activity will be examined.

2.4.1 Psychological Well-being

Psychological well-being measures a person's subjective state or feelings. (Lawton, 1983) Empirical research has shown that experiences with nature positively influence older adults' psychological well-being (Ottosson & Grahn, 2005; Talbot & Kaplan, 1991). Wilcox et al. (2003) tested if depression and stress had effects on senior's physical activity, and found that when older women had less depressive symptoms and perceived greater stress they were more physically active.

2.4.2 Sense of Community

Sense of community measures the sense of belonging, mutual influence, togetherness, and emotional connections (McMillan & Chavis, 1986). Having common green space was found to increase the sense of community among the elderly. (Kweon et al., 1998) Another study showed that areas with natural features fostered a sense of community, feelings of walking, and the likelihood of social interaction (Kim & Kaplan,

2004). Lund (2002) found that when residents perceived their neighborhood as being a pedestrian environment they presented higher levels of their sense of community.

2.4.3 Perception of Neighborhood Safety

The effect of neighborhood safety on physical activity among the elderly is variable. In this study, perception of neighborhood safety will examine in three aspects; i.e., perceptions to neighborhood problems, crime safety, and traffic safety.

1) Perceived Neighborhood Crime Safety

Frequency of observing others who exercise in a neighborhood was also found as one of the variables which increased physical activity among older African American women or older women in rural areas. (King et al., 2000; Wilcox et al., 2000) However, other studies show no relationship between perceived neighborhood safety and senior's physical activity. (Booth et al., 2000; Fisher et al., 2004; King et al., 2000)

Three study suggested that the greater the perceived neighborhood safety, the higher the levels of physical activity among the elderly (Centers for Disease Control and Prevention (CDC), 1999; Li et al., 2005; Wilcox et al., 2003). Other studies found that at the neighborhood level violence rates influenced elderly men's physical activity while the level of older women's physical activity was associated with the perceived neighborhood safety. (Piro et al., 2006)

2) Perception of Neighborhood Problems

The perceptions of neighborhood problems were also evaluated as having effects on senior's physical functions and physical activity. Balfour and Kaplan's study (2002) found that the physical functions of older adults were highly affected by the conditions of their neighborhood's physical environment. A study for 883 seniors aged 55 years and older in the Alameda County found that among six neighborhood problems (e.g. traffic, noise, crime, trash and litter, lighting, and public transportation), problematic neighborhood environments with excessive noise, inadequate lighting, and heavy traffic resulted in both overall functional loss (6.1%) and lower-extremity functional loss (3.9%) of the elderly over a one year period. On the other hand, the perception of neighborhood problems (e.g. gangs, graffiti, violent crime, vandalism, burglary, abandoned or boarded-up buildings, and alcohol or drug use) had no effect on senior's physical activity and walking (Fisher et al., 2004).

In spite of focusing on middle age group of African American women, Zenk et al. (2007) studied the effects of annual police-reported crime incidents including robbery, aggravated assault, criminal sexual assault, homicide, total violent crime within one-mile radius from participants' home on their walking activity, and found that those who resided in neighborhoods with more robberies tended to less walk than those who lived with few robberies.

3) Perception of Traffic Safety

Regarding the perception of traffic safety, the relationship between senior's physical activity and only two variables – traffic volume and safety from traffic – have been tested. (King et al., 2000; Li et al., 2005; Wilcox et al., 2000; Wilcox et al., 2003) Among previous literature, Wilcox et al. (2003) suggested that when older women perceived lighter volumes of traffic they were more likely to be associated with higher levels of physical activity. Another study showed an interesting finding in which older adults that felt safe from traffic walked more in neighborhoods which had greater numbers of street intersections (Li et al., 2005).

2.5 The Relationships between Personal Factors and Seniors' Physical Activity

Personal factors including demographic characteristics and health status have been found to have significant relations with seniors' physical activity. Among demographic characteristic, gender, age, education level, income, and ethnicity were often revealed as important variables. For example, Deci and Ryan (1985) found that physical health, financial independence, program availability and perceived social support were significant barriers to access physical activity. In the study of Green and Ottoson (1999), level of education was reported as the key determinant with regard to influence on health-related behavior. In addition, Guinn and Vincent (2002) suggested that regular physical activity among older adults was associated with those who were higher educated, had higher levels of religious well-being and life satisfaction, and perceived themselves to be healthier.

Among sub-population groups, African American and American Indian were found as the one of least active group (King et al., 2000; Wilcox et al., 2000). Specific to African American women, several qualitative studies have reported that responsibility for caring children, social supports (family and friends), inability to participate in expensive exercise program, and unsafe neighborhood environments were major barriers to participate in physical activity (King et al., 2000; Nies et al., 1999; Sharma et al., 2005; Walcott-McQuigg et al., 2001). In particular, Walcott-McQuigg et al. (2001) tried to find factors that influence on physical activity under the frame of the ecological models. Throughout qualitative research, perceptions of physical activity and exercise, perceived barriers to exercise, benefits and motivators to exercise in the intrapersonal and interpersonal level and factors that would enhance the successful delivery of a program, and presence of administrators/community leaders in the environment/policy level were found as important factors that affect African American women's physical activity.

CHAPTER III

STUDY PURPOSE AND HYPOTHESES

3.1 Purpose of the Study

The general purpose of the research is to identify objective natural and built physical environmental variables that influence the level of physical activity among older African American women. Objective physical environmental variables will be grouped in either natural or built environments and accessiblity, and be measured within two levels of buffers (nearby environment and neighborhood environment). The long-tem goal of the research is to help promote physical activity among older African American women by improving their neighborhood environmental contexts including facilities, street-levels, neighborhoods, and community environment. The conceptual diagram of research is presented in Figure 3-1.

In order to accomplish this general purpose, four specific objectives will be pursued:

A. To investigate the physical activities and places for physical activities that older African American women are engaged in. A survey questionnaire will be designed to capture types of physical activities and places for physical activities that older African American women generally participate in, and to calculate if their physical activity level meets national recommendations. Also, questions about physical health status and socio-demographic information will be asked to control for participant's answers.

B. To explore the influence of objective environmental factors on the level of physical activity among older African American women. The direct relationship between objectively measured natural and built environments and older women's physical activity will be tested using various statistical analyses. The environmental characteristics surrounding participant's homes will be measured using Geographic Information System (GIS) and aerial photographs. Also, a survey questionnaire will be developed to investigate the most frequently used places or facilities for older women's physical activity.

C. To explore the mediating effects of psychological well-being, sense of community, and perception of safety (perceptions to neighborhood problems, crime safety, and traffic safety) on older African American women's physical activity. Previous literatures showed that these constructs are associated with either natural or built environments, or older adult's physical activity. In this study, these constructs will be examined as potential mediators between objective environments and older women's physical activity.

D. To identify design and policy implications that may enhance natural and built environments in ways that encourage older African American women's physical activity. Based on research results, design implications on environmental contexts may be suggested to promote physical activity among older African American women.

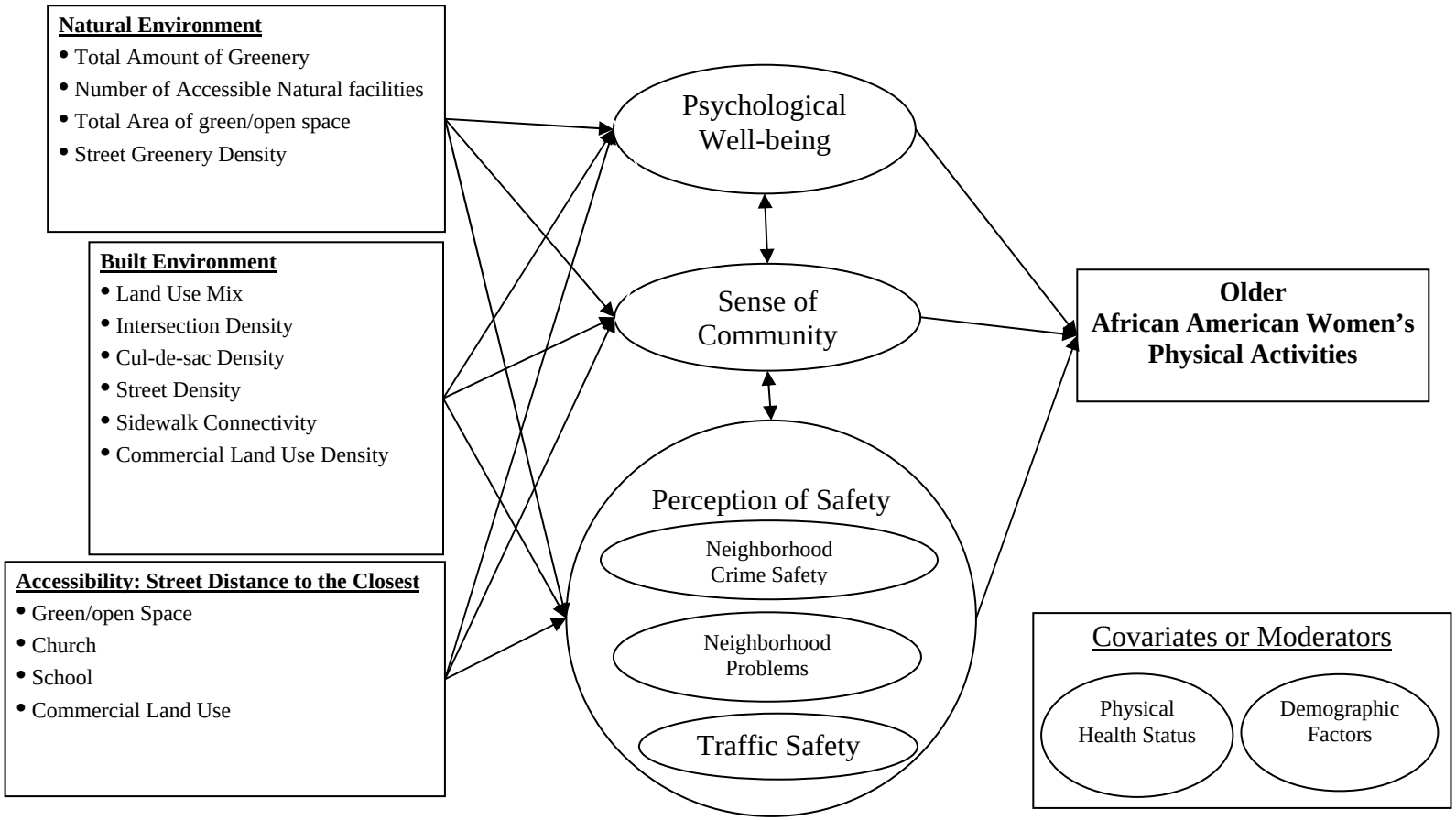


Figure 3 -1 Conceptual Diagram of Research

3.2 Research Statements and Hypotheses

To address the above objectives, five statements are made, and twenty hypotheses will be tested. The first two hypotheses will explore the frequently used places for older African American women's physical activity. The second four hypotheses will test if natural factors influence the level of physical activity among older African American women. The third six hypotheses will examine how built environment affect older women's physical activity. The fourth three hypotheses will test the distance impacts of accessibility to natural/built facilities on older women's physical activity. Finally, last four hypotheses will examine the relationship between the level of physical activity and the proposed mediators - psychological well-being, sense of community, perception of neighborhood crime safety, and perception of traffic safety. The hypotheses are:

Statement 1: Various types of, and a number of natural and built facilities promote older women to be more physically active.

- **Hypothesis 1-1**: Older African American women will participate in physical activity in the context of their neighborhood where the places will be publicly and easily accessible (e.g. streets, parks, public schools) rather than privately-paid places (e.g. gym).
- **Hypothesis 1-2**: Older women who are physically active will live in the neighborhood where more facilities/services/conveniences are located.

Statement 2: Natural environment affect the level of older African American women's physical activity.

- **Hypothesis 2-1**: When older African American women are exposed to more abundant greenery, they will be more highly engaged in physical activity.
- **Hypothesis 2-2**: Older women who are live in the neighborhood with more green and open spaces will show higher level of physical activity than those who has less green spaces in the neighborhood.
- **Hypothesis 2-3:** Older women will present higher level of physical activity if they live in which the street greenery (e.g. canopied trees, landscaped buffer) is more abundant.
- **Hypothesis 2-4**: Older African American women who live in the areas with more number of parks will be more highly engaged in physical activity than those who with less number of parks.

Statement 3: Built environment affect the level of older African American women's physical activity.

- **Hypothesis 3-1**: Older women who are physically active will live in the neighborhood where built environment presents with more sidewalks, and more connected sidewalks.
- **Hypothesis 3-2**: The neighborhood with more intersections will increase older women's physical activity.

- **Hypothesis 3-3**: Older women who are physically inactive will live in the neighborhood with more cul-de-sacs.
- **Hypothesis 3-4**: The neighborhood with highly mixed land-use will promote older women to be more physically active.
- **Hypothesis 3-5**: The neighborhood having more commercial land use will promote older women to be more physically active.
- **Hypothesis 3-6**: The neighborhood with more streets will increase older women's physical activity.

Statement 4: Closer distance to natural and built facilities promotes older women to be more physically active.

- **Hypothesis 4-1**: The closer locations of natural facilities (e.g. parks, walking trails, open space) will increase physical activity among older African American women.
- **Hypothesis 4-2**: Older women who are physically active will live in the neighborhood where conveniences/stores are located in easily accessible distance.
- **Hypothesis 4-3**: The closer churches are located, older women will be the more physically active.
- **Hypothesis 4-4**: Older women who are physically active will live in the neighborhood where public schools are located in easily accessible distance.

Statement 5: The effects of natural and built environments on older African American women's physical activity will be mediated by psychological well-being, sense of community, and perception of safety.

- **Hypothesis 5-1**: The older women who live in more natural environments will be associated with higher level of physical activity through higher levels of psychological well-being.
- **Hypothesis 5-2**: The neighborhoods having more natural environmental variables and built environment encouraging the elderly in physically active will increase the sense of community, and the higher sense of community will result in older women being more physically active.
- **Hypothesis 5-3**: The more natural the environment, the greater the neighborhood safety older women will perceive; this will increase their level of physical activity.
- **Hypothesis 5-4**: The perception of traffic safety will mediate the relationship between the built environment and older women's physical activity.

CHAPTER IV

METHODS

4.1 Research Design

The research design was a cross-sectional correlational study. The independent variables were objectively measured as both natural and built environments, and the dependent variable was the physical activity of older African American women. Additionally, psychological well-being, a sense of community, and perception of neighborhood safety were measured to evaluate mediation effects between the physical environment and the level of physical activity. In this study, it was hypothesized that both the natural and built environments in which older women live have an influence on their level of physical activities.

4.2 Study Site, Population and Sampling

4.2.1 Study Site and Population

The study site was Bryan, Texas, a city located in Brazos County in the east central portion of the state of Texas; approximately 92 miles from Houston (The City of Bryan, 2006). The study sample was made up of older, African American women residing in Bryan, Texas. For the study purpose, the sample was identified to be those aged between 55 and 84, who were currently living in independent houses such as single-family homes or multi-family homes. The sample did not include women living

in any type of special setting such as assisted living, long-term care facilities, or skilled nursing homes where people would be possibly engage in physical activities at a caregiver's request, or based on care programs.

4.2.2 Sampling

As ethnicity was not allowed to be accessed by public, the addresses of the study sample were systemically drawn using both the voter registration database and the 2000 US Census block data (see Figure 4-1). The voter registration list for the city of Bryan was purchased from the Brazos County Voter Registration Department, and the 2000 US Census was obtained from the Department of Information Technology in the City of Bryan.

First of all, the voter registration list was used to identify older women aged 55 to 84, living in independent settings. The voter registration card allows identifying one's gender to be optional, so the record showed three categories of gender: i.e., male, female, and undefined. The satisfied samples in the voter registration list met the following three criteria: 1) males were excluded; 2) persons born between 1/1/1923 and 1/1/1952 were selected; and 3) persons who lived at addresses identified to be institutionalized facilities (e.g., nursing homes, assisted living facilities, Alzheimers care units) were excluded. In the city of Bryan, a total of 13 institutionalized facilities provided these kinds of special care services to the elderly. The selected voters' addresses (N=2, 922) were then geo-coded on the map for next step in this research (see Figure 4-2).

At the second stage, the specific census blocks representing over 80 percent of residents identifying themselves as African American women aged 50 to 74 were identified based on Summary File 1 from the 2000 US Census. The voters' addresses falling into the selected census blocks, 255 in number, were used as the final list for the mailed-out survey (see Figure 4-3). Additionally, 27 survey questionnaires were handed out to older African American women who met the criteria for age and independent living in three churches in the Bryan area, with the aid of an African American female former professor at Texas A&M University. Those who received the survey were requested to mail the questionnaire to the corresponding address after completion.

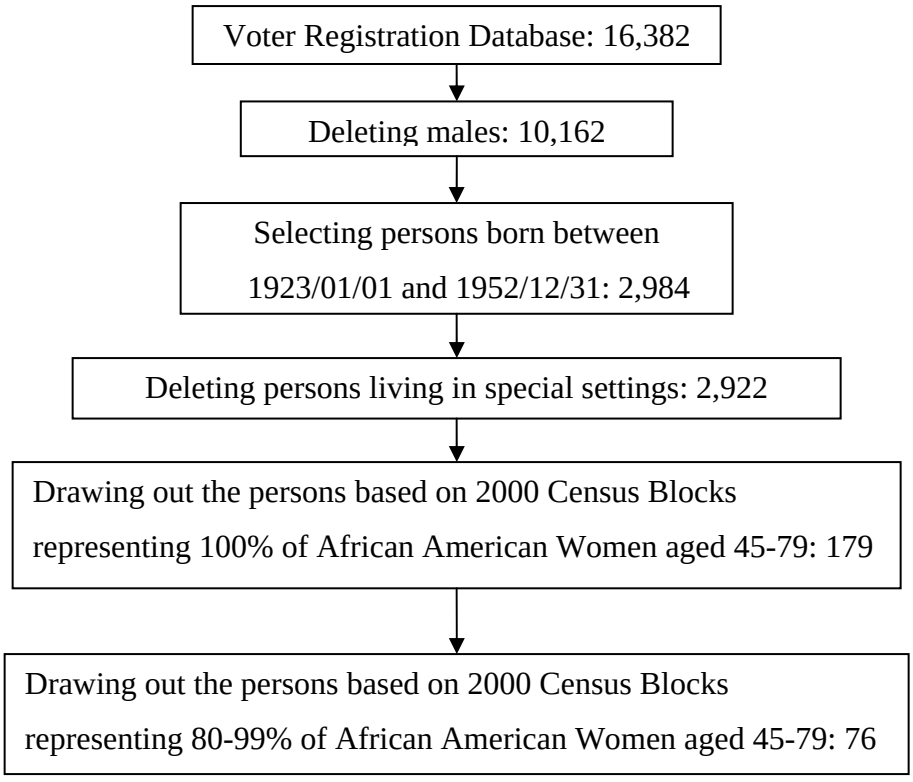


Figure 4 -1 Steps for Systemic Sampling Plan

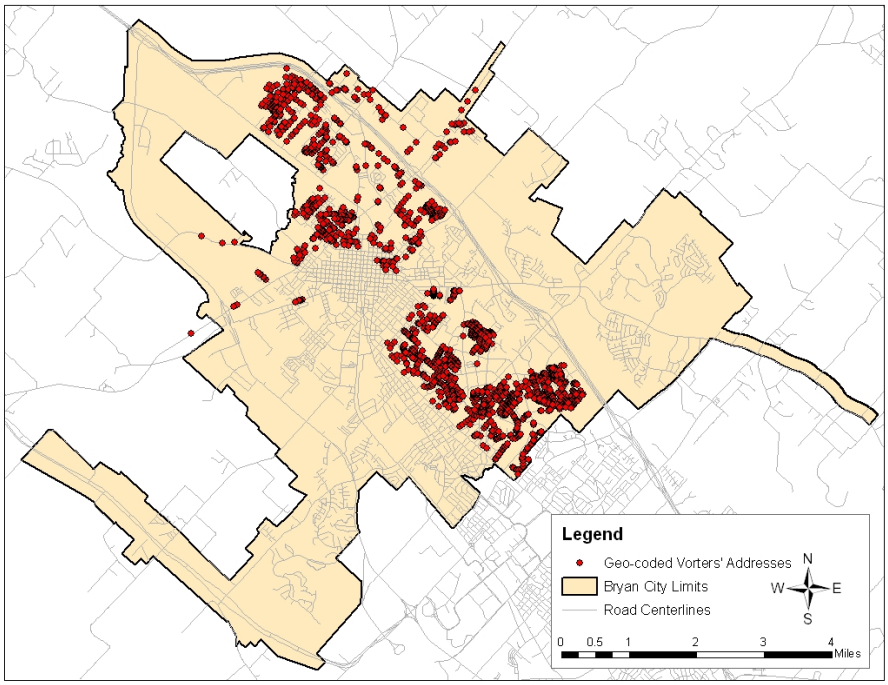


Figure 4 -2 Geo-Coded Voters' Addresses

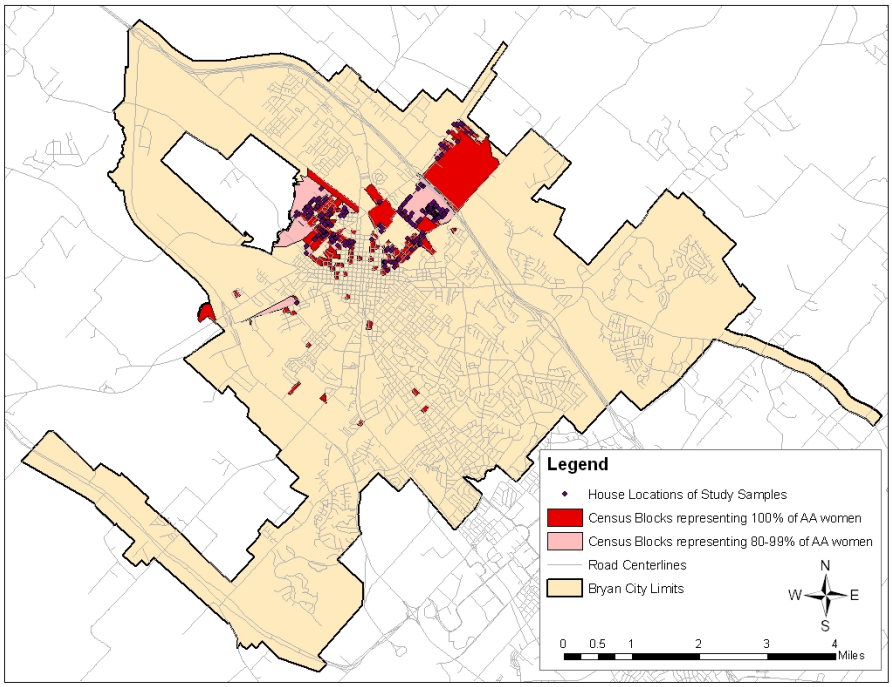


Figure 4 -3 Locations of Study Samples

4.3 Survey Procedure

Data were obtained through a mail-out survey during October and November, 2007. The survey questionnaire asked about participation in total physical activity during the last four weeks, that is, respondents' answers were based on their activities in September and October. During this period, the weather conditions in College Station are normally good, with an average temperature between 70^{o}F and 79^{o}F and average precipitation of about four inches (Texas Weather, retrieved Jan 18, 2008 from http://www.idcide.com/weather/tx/college-station.htm).

The self-administrated survey questionnaire was carefully designed; since target population was older adults, the questionnaire had a large font size (at least 14), with an appropriate font style, considerable blank space, and easy-to-answer formats (Herzog & Rodgers, 1992; Stewart et al., 2001).

African Americans are often underrepresented in research because this population is infrequently reached, and generally yields a low response rate in mail surveys (Satia et al., 2005; Sheldon et al., 2007). To increase the response rate, as Dillman (2000) suggested, incentives ($5.00 gift cards) were also announced on the first page of the questionnaire, mentioning that such gifts would be given to those who returned the completed survey questionnaire. During a period of two months, both the entire survey questionnaire and follow-up reminder cards were sent twice, respectively. In the mean time, incomplete surveys (The surveys with less than 1% of the answers missing were only accepted) were sent back to the respondents to obtain complete surveys.

4.4 Response Rate

From the total sample of 255 mail-out surveys, 63 (24.7%) were completed and returned, and 43 (16.9%) were ineligible (e.g., no longer residing in the specified addresses, incomplete survey questionnaire, etc.). From the sample of 27 handed-out surveys, 17 (63%) complete questionnaires were returned, and 3 (11.1%) surveys were excluded because the participants lived in an area outside of Bryan's city limits. The response rates of the two survey groups were 29.6% and 70.8%, respectively, which were calculated using denominators of 212 (255-43) and 24 (27-3) (See Table 4-1).

To sum up, a total 282 survey questionnaires were distributed either by mail or by hand, and the responses of 80 (33.9%) older African American women were used in data analyses. The house locations of 80 respondents were shown in Figure 4-4.

Table 4 -1

Response Rate by Survey Groups

Category	Sample Size	Completion	Returned/ Incomplete	Total	Response Rate
Mail-out Survey Group	255	63 (24.7%)	43 (16.9%)	106 (41.6%)	29.6% 63/212)
Hand-out Survey Group	27	17 (63.0%)	3 (11.1%)	20 (74.1%)	70.8% (17/24)
Total	282	80 (28.4%)	46 (16.3%)	126 (44.7%)	33.9% (80/236)

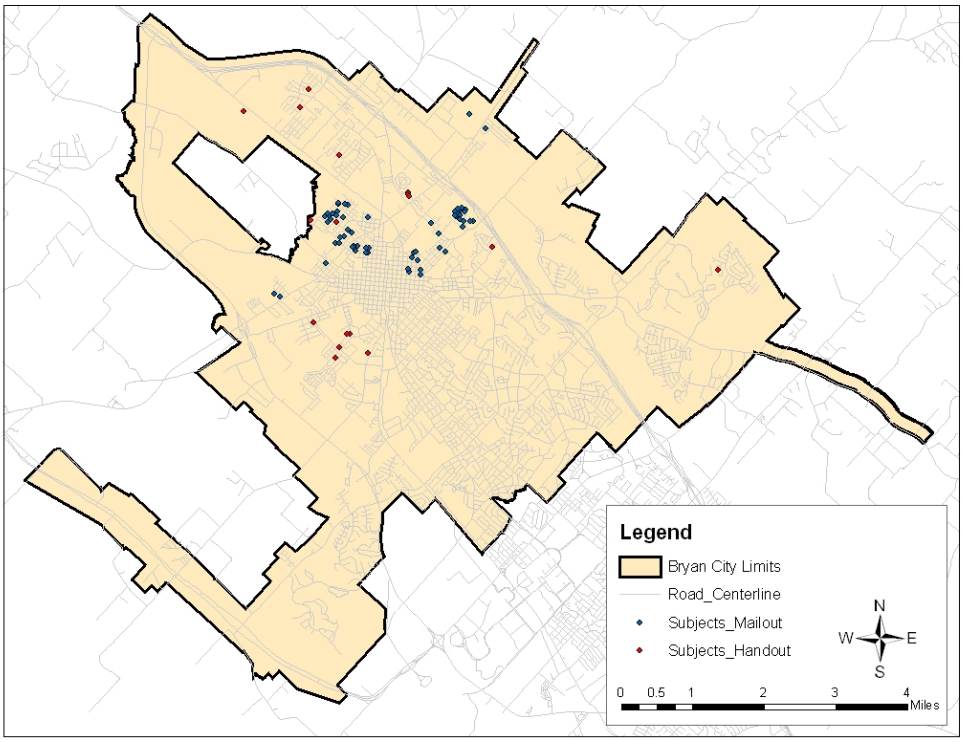


Figure 4 -4 Locations of Respondents' Houses

In the following equation, the standard error of the mean was calculated to measure how representative the selected sample is likely to be to the population (Field 2005). To obtain a closer estimated value, the finite population correction (FPC), an adjusted weight of variance of an infinite population, was computed in the equation.

$$Se_Y = \sqrt{\frac{1}{n}}\sqrt{(1-\frac{n}{N})} = \sqrt{\frac{1}{80}}\sqrt{(1-\frac{80}{282})} = 0.095$$

where n is the number of the sample; N is the number of the population.

The small value of the standard error ($Se_Y = 0.095$) indicates that the selected sample is likely to accurately reflect the population to an extent.

4.5 Measures

The entire survey questionnaire had a total of 133 questions and took about 15-20 minutes to complete. The designed survey questionnaire consists of six sections: a) the modified version of CHAMPS, b) Psychological Well-being, c) Sense of Community, d) Perception of Neighborhood Safety, e) Physical Health Status, and f) Background Information. Most measures used in this study were already proved to be valid and reliable in other published papers. A few questions in the sections regarding physical activities, perception of neighborhood environment, and physical health status were modified for this study's purpose. All data except environmental measures were collected from respondents.

4.5.1 Physical Activity

Gathering information regarding levels of physical activity among older African American women was the primary study outcome, and was assessed through a modified version of the Community Healthy Activities Model Program for Seniors (CHAMPS) Questionnaire. CHAMPS is a self-administered survey questionnaire and was developed to measure physical activity among older adults using a comprehensive list of activities (Harada et al., 2001; Stewart et al., 2001).

The CHAMPS was modified in two ways. First, 28 items defined as all exercise-related activities from the original measure (a total 41 items) were selected, and two items were added to assess outdoor activities – playing disc (disk) golf and horseshoes. The list of activities in this study included: walking (fast/leisurely/for errands), jogging, biking, using aerobic machines, swimming(gently/fast), water exercise, stretching, yoga/tai-chi, aerobics, dancing, strength training (light/heavy), general conditioning, basketball, golf (cart/walking), tennis (single/double), disc golf, horseshoes, housework (light/heavy), gardening (light/heavy), and working on a car. Each activity was accompanied by questions regarding weekly frequency and weekly duration (0 to more than 10 hours) over the past 4 weeks. Second, the list of potential places for the specific physical activities was provided and respondents were asked for each type of activity: "Where do you do this activity? Check as many as apply."

Total physical activity was calculated in two ways; caloric expenditure/week and frequency/week. Also, based on the CHAMPS coding algorithms, the level of physical activities were categorized as all physical activities and moderate-intensity physical activities ($MET \geq 3.0$). Differing from the CHAMPS coding algorithms, to avoid the confounding effects of weight, the caloric expenditure/week was calculated without multiplying respondents' weight (Resnicow et al., 2003). In this study, only the total caloric expenditure/week of all physical activities was used as the dependent variable because in Stewart and colleagues' study (2001) the caloric expenditure measures showed better reliability/stability than frequency measures in 6-month period test-retest.

4.5.2 Psychological Well-being

Psychological well-being was assessed using the morale section (9 items) drawn from the Philadelphia Geriatric Center Multilevel Assessment Instrument (PGC-MAI). Respondents were asked their feelings regarding daily life (e.g., do you get upset easily?) as compared to last year (e.g., do little things bother you more this year?) and were asked to answer either yes or no. The scores from these three items were reversed, since these questions were described in a positive way. Only negative answers on items (which represent a positive state or feelings for life) were counted, based on the PGC-MAI manual.

4.5.3 Sense of Community Index

The sense of community index (12 items) designed by McMillan and Chavis (1986) was used to measure the sense of belonging and emotional connections to the neighborhood. Respondents were asked to choose either true or false in response to 12 statements. The scores for four items were reversed and answers representing a positive response to the statements were scored based on the instruction. Pretty et al. (1994) provided the evidence of reliability of the sense of community index in two studies where the alpha coefficient was 0.72 in the first study and 0.78 in the second study.

4.5.4 Perception of Neighborhood Safety

The perception of neighborhood safety was assessed by 22 items in three constructs: Neighborhood Problems, Perception to Crime Safety, and Perception to Traffic Safety.

Neighborhood Problems assessed how many problems respondents perceived in their neighborhood. Features of seven neighborhood problems included gangs, graffiti, violent crime, vandalism, burglary, abandoned or boarded-up buildings, and alcohol or drug use which were all identified in a previous study (Fisher et al., 2004). Respondents were asked to choose either yes or no.

Perception of Crime Safety assessed to what extent the neighborhoods were considered safe enough due to crimes perceived by older women that might prevent them from being engaged in physical activity. A total of five statements were developed from the "Safety from Crime" section of the Neighborhood Environment Walkability Scale [NEWS] and from questions other authors have used (Li et al., 2005; Piro et al., 2006; Wilcox et al., 2003). Perception of Crime Safety included statements about crime (e.g., My neighborhood is safe from crime) and feelings regarding safety (e.g., I feel safe walking or jogging alone in my neighborhood in the evening). Respondents were asked to rate these statements on 5-point scale ranging from 1(strongly disagree) to 5(strongly agree).

Perception of Traffic Safety consisted of nine statements regarding how streets or pedestrian environments made these older women feel regarding whether their neighborhood was safe from traffic and other pedestrian safety concerns. Eight

statements were drawn from the “Places for Walking and Cycling” and “Safety from Traffic’” in the Neighborhood Environment Walkability Scale [NEWS]. One statement for a lawn buffer: “There are lawn buffers between the street and the sidewalks along the street I live that make me feel safe to walk in my neighborhood” was added. Responses for these items were rated on a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree).

4.5.5 Physical Health Status and Demographic Information

Physical health status (27 items) was self-reported using the Physical Health Section (25 items) in the Philadelphia Geriatric Center Multilevel Assessment Instrument (PGC-MAI). provided by the Philadelphia Geriatric Center and two additional questions. The Physical Health Section was calculated in three subscales according to the PGC-MAI manual: the Self-Rated Health Index, the Health Behavior Index, and the Health Conditions Index.

The Self-Rated Health Index (4 items) was assessed by summing up the scores of one item with a 4-point scale and three items with a 3-point scale. The responses ranged from 4 to 13, and higher numbers indicated a better health status. The Health Behavior Index (3 items) included questions regarding how many days respondents visited and stayed in a hospital and how many days were spent sick in bed. Responses for each item were converted to a z score and then summed up. The highest score in this index represented more doctor visits or days ill. The Health Conditions Index asked how good the respondent’s eyesight and hearing were and also provided a list of diseases (18

items). Both eyesight and hearing were rated on a 3-point scale ranging from totally blind (or deaf), to poor, and good/adequate. The types of diseases were asked about eliciting responses of either "yes" or "no." Scores for this index were computed by counting the answers marked "good or adequate" and "no." Also, two items were added to inquire about smoking status, asking for a response of either "yes" or "no," and use of alcohol drinks with a 3-point scale ranging from none, 1-5, and 6 or more.

Demographic information included questions regarding age, height, weight, ethnicity, marital status, education level, employment status, income level, religion, car ownership, number of household members living with the elderly in the same house, and length of residency at current address.

4.6 GIS Procedure and Physical Environmental Measures

4.6.1 GIS Procedure

Physical environmental variables were measured using Geographical Information System (GIS) data and aerial photograph images. All GIS data were obtained from the Department of Information Technology in Bryan, and the aerial photograph images were downloaded from the USGS Geospatial Data Gateway website (http://datagateway.nrcs.usda.gov/).

The downloaded image was a Digital Orthophoto (DOQ), which was taken in 2006 and contained color-infrared with a 2m x 2m resolution. The DOQ image covered the Brazos County area so that the file size was too big to operate an image classification.

As a result, the DOQ image was first cropped only to include some parts of the Bryan area, and then the subset DOQ image was classified to calculate the amount of greenery.

All physical environmental variables were identified through three steps: 1) participants' addresses were geo-coded, 2) two levels of network distance buffers were created on the basis of each participant's house location, and 3) GIS data were clipped on the basis of two buffers, and all variables were measured.

4.6.2 Physical Environmental Measures

The independent variables, natural and built environments, were defined in two levels of environmental boundaries from two previous studies: 1) nearby environment - 0.5 miles network distance from a participant's house (Li et al., 2005); and 2) neighborhood environment - 1 mile network distance from a participant's house (King et al., 2005).

ArcGIS 9.2 software was used to develop a total of 12 physical environmental variables. First, natural environments (2 variables) included the total area of natural space (e.g., trails, parks, undeveloped green areas) and the number of accessible natural spaces. Second, built environment measures (6 variables) included the land-use mix, intersection density, cul-de-sac density, street density, sidewalk connectivity, and commercial density. Finally, accessibility measures (4 variables) included the street distance to the closest natural space, schools, churches, and commercial areas. The definitions for all natural and built environmental variables are summarized in Table 4-2.

Table 4 -2

Summary of Environmental Variables

Variables	Definition	Equation
Natural Environments		
Density of Green Spaces	Total green and open spaces (e.g. natural preserved, open area).	Total area of green spaces/ total area of environmental boundary (acres).
Number of Accessible Green Spaces	Total number of accessible green spaces in buffer area.	Number of green spaces within the area of environmental boundary.
Greenery Density	Total amount of greenery including trees, shrubs, and grasses.	$G.D = \left(\sum_{j=1}^{a} a_{ij} (\frac{1}{10{,}000}) \right)$ a_{ij} = area (m^2) of patch ij.
Street Greenery Density	Total amount of greenery including trees, shrubs, and grasses within the defined street buffers.	$SDG = \left(\frac{\left(\sum_{j=1}^{a} a_{ij} (\frac{1}{10{,}000}) \right)}{AreasofTot \quad alStreetBu \quad ffers} \right)$ a_{ij} = area (m^2) of patch ij.
Built Environments		
Land-Use Mix	Evenness of distribution of sqft of residential, commercial, industrial, ranch/timber land, exempt, vacant & others.	$LUM = (-1)\left(\sum_{i=1}^{n} (\rho_i)(\ln \rho_i) \right) / \ln n$ ρ_i = the proportion of estimated square footage attributed to land use i . n = the number of land uses (n = 7)
Intersection Density	Ratio of intersection to street length	Number of intersections/total street length (miles)
Cul-de-sac Density	Ratio of cul-de-sac to street length	Number of cul-de-sacs/total street length (miles)
Street Density	Ratio of street to buffer area	Total street length/ total area of environmental boundary
Commercial Density	Ratio of commercial area to buffer area	Total commercial area/total area of environmental boundary

Table 4-2 Continued

Variables	Definition	Equation
Sidewalk Connectivity	Average sidewalk system	Total sidewalk length/total street length (miles)
Accessibility		
Distance to the Green space	Street distance to the closest Green space	
Distance to the Commercial Area	Street distance to the closest Commercial Area	
Distance to the School	Street distance to the closest School	
Distance to the Church	Street distance to the closest Church	

The ENVI 4.2 program and FRAGSTATS 3.3 were used to measure two greenery variables, the total amount of greenery and the street greenery. To obtain these two greenery variables, the DOQ image was first classified with 10 classes using an ISODATA unsupervised classification method.

After identification, 10 spectral classes were combined into two types of classes, i.e., greenery and non-greenery. The total amount of greenery was calculated using FRAGSTATS 3.0 after being defined by two levels of environmental boundaries. Street greenery (See Figure 4-5) was measured in two steps. First, within two levels of environmental boundaries, street buffers was created depending upon the right of way width of the road hierarchy, referring to road design guidelines for the City of Bryan (See Table 4-3). Next, the clipped greenery based on street buffers was calculated using FRAGSTATS3.0.

Table 4-3

Street Classification Design

	Local	Collector	Minor Arterial	Major Arterial
Right of Way Width	50’	80’	100’	120’

Source: Design Guidelines (Revised 2003), City of Bryan.

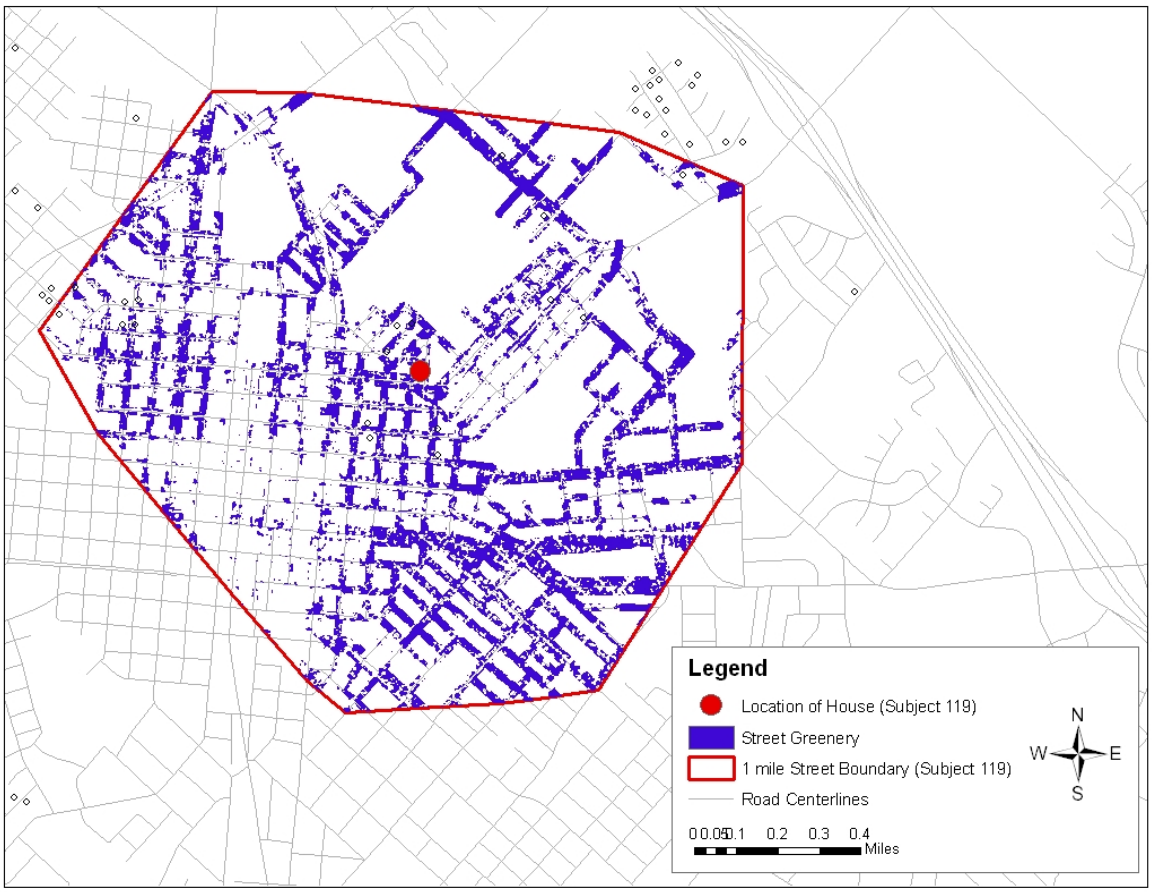


Figure 4 -5 Example of Street Greenery

(1 mile street distance from respondent’s house)

4.7 Pilot Study

Before conducting the surveys, a pilot study was conducted. This was done to ensure the appropriateness of the self-administered survey questionnaire; that is, to see whether it was possible to estimate the response rates, the item non-response rate, and the variable distributions (Dillman, 2000). Six older African American women were recruited from nearby neighborhoods and through the African American Professional Organization (AAPO) at Texas A&M University. The contents of the questionnaire were tested to provide an opportunity to examine the problems with or contributions of those items. Also, survey time and their understanding for answering questionnaire were asked. In the course of this process, a few additional places for specific physical activities were added and a few questions were rephrased and enhanced by talking with the pre-test participants.

4.8 Statistical Analysis

The survey questionnaire was distributed two ways, by mail and handed out; this could possibly cause some potential bias between the two respondent groups varying by demographic and health status, and physical and physical neighborhood environments. First of all, either a *t*-test or Chi-square test for all variables was conducted to identify the differences between the two survey groups. Results showed that only three environmental variables were significantly different at the $\rho < .001$ level (see Appendix A). In both the path model and the SEM model, the differences between these three variables were tested by assigning additional paths called “methods”.

Next, descriptive analyses and correlation tests for all variables were conducted to examine the data distribution and initial relationships between the variables. At this step, variables with a higher kurtosis (> 2.5) were identified and then transformed after multiple imputations. Also, marital status and employment status were recategorized because the initial categories for these two variables could have possibly led to incorrect correlation results. Therefore, marital status data was redefined from five categories (married/common-law/separate/widowed/never married) to three categories (married or common law/separate or widow/never married), which represented the experience of marriage with or without a spouse. Employment status data was also redefined from four categories (full-time/part-time/unemployed/retired) to three categories (full-time/part-time/unemployed or retired), which represented the time availability for subjects to be engaged in physical activities.

As a third step, three imputed data sets were created through multiple imputations using NORM v.2.03. Although the total data contained less than 1% of the missing value, a few questions such as income, weight, alcohol drinking behavior and the frequency and hours participating in physical activity were relatively highly not responded to, which could have led to biased results (Darmawan, 2002). After imputation, the kurtosis of each variable was reexamined. Data with a higher kurtosis (10 variables) were treated one of two ways: 1) the data was transformed by applying a square root transformation, or 2) the score was changed with the next lowest or highest score in the data set (Field, 2005).

Next, exploratory factor analyses were run and Cronbach α values were obtained to examine the reliability of each factor. Based on the results of exploratory factor analyses, measurement SEM models were again tested for all latent factor variables to determine their adequacy. When the initial construct did not satisfy the model fit, latent variables were reconstructed using a measurement SEM model.

Finally, the path model and the SEM model were run with three imputed data sets. The parameter estimates resulting from the analysis of each of the three data sets were combined in NORM v.2.03 using Rubin's rules for multiparameter inference (1987). The output of NORM v.2.03 provided unestimated parameters, standard errors, t-ratio, degrees of freedom as well as p-value. Most statistics were calculated using the SPSS 15.0 program and both the path analysis and the SEM were conducted using AMOS 7.0.

CHAPTER V

RESULTS

5.1 PART 1: Patterns of and Places for Physical Activity

5.1.1 Descriptive Statistics

1) Characteristics of the Sample

The characteristics of the respondents are summarized in Table 5-1. The mean age for all respondents was 66.84 years old. The mean height and weight of each individual was 64.63 inches and 186.69 pounds, respectively. The height distribution of respondents was relatively aggregated between 60 and 65 inches, which resulted in a high kurtosis (see Figure 5-1). On the other hand, the weight of the respondents was distributed in a wide range with a larger standard deviation (see Figure 5-2).

The distribution of education qualifications was similar between the two groups; 54% of respondents were in the lower education category (less than Community College) and 45% of respondents had advanced educational qualifications (College and Graduate Degrees).

A higher proportion of respondents were not living with a spouse (70%) and more than half of the respondents (61%) were either not employed or retired. The distribution of household income leaned toward less than $40,000 (80%). All respondents reported that they had a religion (97.5%), although 79% of the sample was

not affiliated with any particular religious place. The mean number of household members living in the same house was 1.7 persons, and 18% of respondents lived alone. The mean of residency years was 24.99 years, ranging from 0.3 to 71 years.

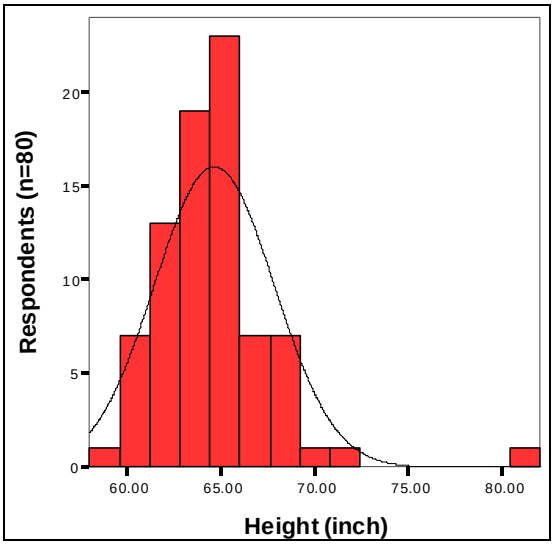


Figure 5-1 Height Distribution

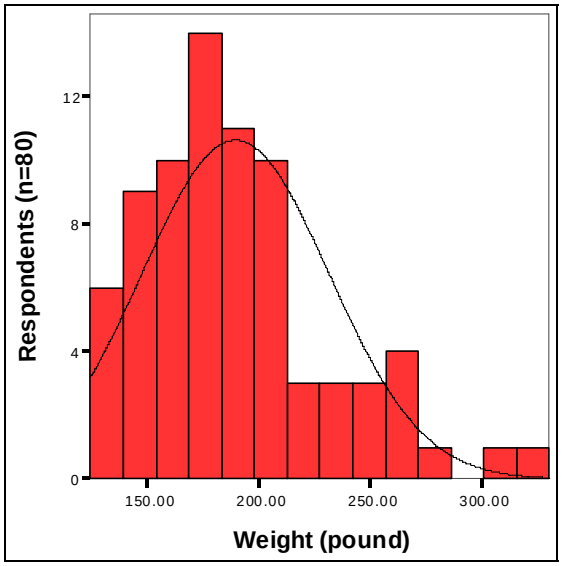


Figure 5-2 Weight Distribution

Table 5-1

Characteristics of Respondents

	N	Range	Mean(SD)	Skewness	Kurtosis
Age	80	55 - 84	66.84 (8.08)	.44	-.67
Height(Inch)	80	58 - 82	64.63 (3.19)	2.07	10.07
Weight(Pound)	76	125 - 330	189.69 (41.79)	1.05	1.22
Education	79			.50	-1.02
Less than high school			18 (22.5%)		
High school/GED			25 (31.3%)		
Community College/ Technical School			15 (18.8%)		
College degree			6 (7.5%)		
Graduate degree			15 (18.8%)		
Marital State	80			-.41	-1.33
Married			24 (30.0%)		
Common-law marriage/living together			1 (1.3%)		
Separated/divorced			17 (21.3%)		
Widowed			32 (40.0%)		
Never married			6 (7.5%)		
Employment State	80			-.47	-1.55
Full time			21 (26.3%)		
Part time			10 (12.5%)		
Not employed			9 (11.3%)		
Retired			40 (50.0%)		
Household Income	76			1.12	.60
Less than 20,000			38 (47.5%)		
20,001-40,000			26 (32.5%)		
40,001-60,000			8 (10.0%)		
60,001-80,000			4 (5.0%)		
Religion	78				
Yes			78 (97.5%)		
Car Ownership	78			2.46	4.13
Yes			69 (86.3%)		
No			9 (11.3%)		
Household members	76	0 - 6	1.70 (1.31)	.70	.31
Residence years	78	.3 - 71.0	24.99 (15.95)	.32	-.41

2) Physical Health Status of the Sample

The physical health status of the respondents is summarized in Table 5-2. The higher proportion of respondents did not smoke (85%) and about 91% of the older women reported that they drank alcohol 1-5 times a week. The mean of the Self Rated Health Index (SRHI) was 8.94, which represented that most respondents rated their status of health either fair or the same as three years ago, or the same as most people their age. The z-score of the Health Behavior Index (HBI) represented that about 73% of respondents were relatively healthy because they visited doctors or were ill fewer days than their peers (see Figure 5-3). The mean of the Health Conditions Index (HCI), representing the number of positive responses from the list of diseases, was 16.81. Only 10% of respondents were free from any disease and had good eyesight and hearing (see Figure 5-4).

Table 5-2

Physical Health Status of Participants

	N	Range	Mean	Skewness	Kurtosis
Smoke (%)	79			-2.13	2.58
Yes			11 (13.8%)		
No			68 (85.0%)		
Drink Alcohols/Week (%)	73			2.34	3.57
None			9 (11.3%)		
1-5 times			64 (91.3%)		
SRHI [a]	79	4.00 - 13.00	8.94 (2.01)	-.32	-.72
HBI [b]	79	-1.82 - 8.85	.00 (2.18)	2.06	4.11
HCI [c]	79	12.00 - 20.00	16.81 (2.03)	-.36	-.53

Note. SRHI[a] represents Self Rated Health Index, HBI[b] represents Health Behavior Index
HCI[c] represents Health Conditions Index

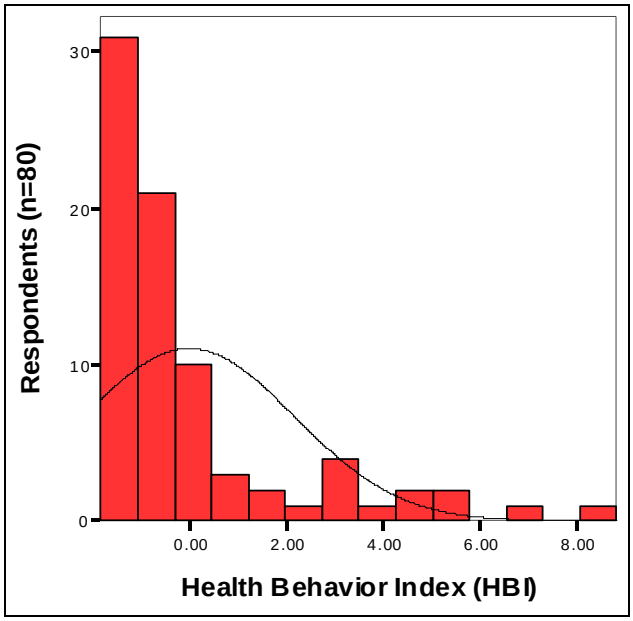


Figure 5-3 Distribution of HBI

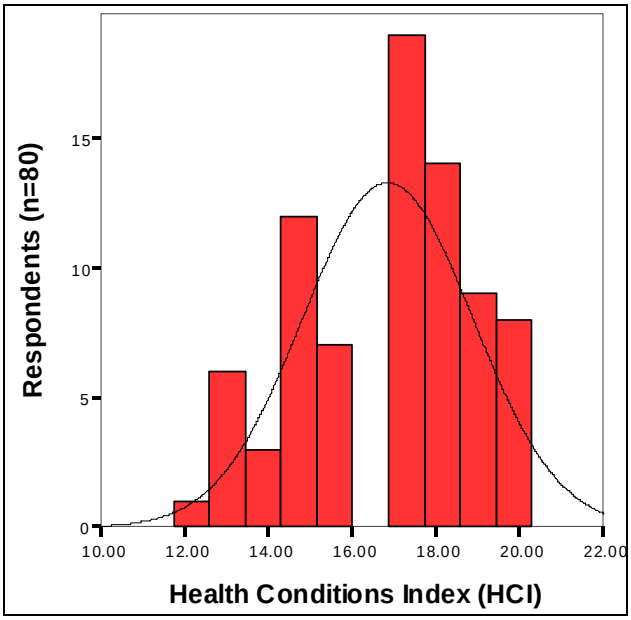


Figure 5-4 Distribution of HCI

Table 5-3 provides the list of diseases (which were counted in the HCI) and the number of respondents who were suffering from the specific type of disease. Older African American women were asked to report any type of disease, no matter how many were experienced, over the previous year.

Hypertension (85%) was the most highly reported medical problem among older African American women. More than half of the respondents were suffering from arthritis (60%), followed by back problems (42.5%), diabetes (28.8%) and heart trouble (17.5%).

Table 5-3

Types of Diseases Respondents Reported

Type of Diseases	Respondents (N =80)
High blood pressure or Hypertension	68
Arthritis, Rheumatism	48
Back problems	34
Diabetes or Sugar sickness	23
Heart trouble	14
Osteoporosis	11
Chronic bronchitis	8
Fibromyalgia/Chronic pain	6
Anemia	6
Cancer	5
Asthma	4
A broken hip or other bones	4
Stroke	3
Liver trouble	1
Lung disease	1
Poor eyesight	9
Poor hearing	8

5.1.2 Types of and Places for Physical Activities

1) Types of Physical Activities

Table 5-4 summarizes the types of physical activities reported by respondents, and the number of people and average times per week associated with each activity for the past four weeks. Respondents were asked to report as many types of activities as they were engaged in. A total of 21 out of the 30 listed physical activities were reported by the 78 respondents. Two persons answered that they were not engaged in any type of physical activity.

The results showed that walking (either walking fast, leisurely, or for errands) was the most common type of physical activity among older African American women. More than 40% of older African American women were engaged in walking and the mean frequency was about 3 times per week. More than 25% of older African American women were engaged in flexibility and conditioning exercises, followed by riding a stationary cycle (19%), dancing (14%) and light strength training (14%).

Among physical activities more associated with work rather than exercise, light work (89%) was highly reported by most respondents, followed by light gardening (50%), heavy work (20%) and heavy gardening (20%).

Table 5-4

Types of Physical Activities Respondents Reported

Type of Physical Activity	N	Mean(SD)
Walk Fast	34	3.15(1.40)
Walk Leisurely	43	2.86(1.55)
Walk for Errands	32	3.59(2.43)
Flexibility	33	3.33(2.52)
Conditioning exercises	21	3.24(1.34)
Ride a stationary cycle	15	2.40(1.40)
Dance/ holi-dance	11	1.77(1.13)
Light Strength training	11	2.82(1.78)
Jogging	5	3.00(1.22)
Heavy Strength training	5	2.00(1.00)
Ride a bicycle	3	3.67(1.16)
Aerobic Dancing	3	2.00(1.00)
Yoga	2	2.00(0.00)
Basketball/soccer, volleyball	1	1.00(0.00)
Aerobic Machine	1	3.00(0.00)
Water Exercise/Aquatic aerobic	1	1.00(0.00)
Light work (e.g. vacuuming)	71	3.32(1.92)
Light Gardening (e.g. watering plants)	40	2.38(1.69)
Heavy work (e.g. washing windows)	16	3.00(2.61)
Heavy Gardening (e.g. spading)	16	1.88(1.36)
Work on Car/lawn mower	9	1.39(0.93)

2) Places for Physical Activities

Table 5-5 shows a simple frequency of the places older African American women used for their physical activity during the previous four weeks (N=78; two respondents reported they were not engaged in any type of physical activity). Respondents could report as many places as possible among the list of places provided in the survey questionnaire.

The most commonly used place for physical activities among older African American women was Home/friend’s home/apartment complex (57.2%). However,

indoor types of activities (e.g., flexibility, conditioning exercises, stationary cycle and heavy/light strength) and heavy/light gardening were more frequently reported than outdoor activities. Among outdoor environments, streets (12.8%), parks (5.8%), and walking/jogging trails (2.9%) were highly reported places where most older African American women walked, either fast or leisurely.

Commonly used facilities for physical activities included churches (5.1%), work places (5.1%), and shopping malls (4.8%) where walking fast or leisurely was the most popular type of physical activity. Other places for physical activities included the gym (2.9%), a public recreation center (1.6%), and schools (1.3%). Rehabilitation and night clubs were also listed, and up to but less than 1% of frequency was reported.

Table 5-5

Places Used for Physical Activities among Older African American Women

Places	Type of Physical Activities	Respondents (N=80)		
		Subtotal	Total	%
On street	Walk fast/ leisurely	36	40	12.8
	Jog	3		
	Ride bicycle	1		
Parks	Walk fast/ leisurely	15	18	5.8
	Basketball	1		
	Flexibility	1		
	Light strength	1		
Walking/jogging trails	Walk fast/ leisurely	8	9	2.9
	Jog	1		
Church or at a place or worship	Walk fast/ leisurely	7	16	5.1
	Dance	2		
	Conditioning exercises	1		
	Heavy strength	1		
	Heavy gardening	1		
	Light gardening	4		

Table 5-5 Continued

Places	Type of Physical Activities	Respondents (N=80)		
		Subtotal	Total	%
Business/ job office/ work place	Walk fast/ leisurely	11	16	5.1
	Flexibility	2		
	Conditioning exercises	2		
	Light gardening	1		
Shopping mall	Walk fast/ leisurely	15	15	4.8
Gym	Walk fast/ leisurely	2	7	2.2
	Conditioning exercises	1		
	Yoga	1		
	Aerobic dancing	1		
	Flexibility	2		
	Heavy strength	1		
	Light strength	1		
Public recreation center	Walk fast/ leisurely	3	5	1.6
	Dance	1		
	Flexibility	1		
School	Walk leisurely	1	4	1.3
	Aerobic dancing	1		
	Stationary cycle	1		
	Conditioning exercises	1		
Night club	Dance	2	2	0.6
Rehabilitation	Dance	2	2	0.6
Home/Friend's Home/ Apartment complex	Walk fast/ leisurely	25	179	57.2
	Jog	3		
	Ride bicycle	2		
	Flexibility	29		
	Conditioning exercises	17		
	Stationary cycle	11		
	Aerobic machine	1		
	Water	1		
	Yoga	1		
	Dance	6		
	Aerobic dancing	1		
	Heavy strength	4		
	Light strength	10		
	Heavy gardening	16		
	Light gardening	43		
	Work on car	9		

Table 5-6 summarizes the destinations to which older African American women frequently walk. The destinations for walking to do errands are not included in Table 5-5. The list of destinations for errands was given in order to allow for multiple answers. According to the responses of 32 older African American women, the most popular destinations reached by walking were convenience/grocery stores (17%), churches/places of worship (15%), discount stores (13%), and schools (12%). Respondents also often walked to work places (9%), pharmacy/drug stores (7%), and the post office (7%).

Table 5-6

Destinations for Walking to Do Errands

Destinations	Respondents (N=80)
Convenience, deli, or grocery store	16
Church or at a place of worship	14
Department, discount or hardware store	12
Schools	11
Your job	8
Pharmacy/drug stores	7
Post office	7
Bank	4
Restaurant, pub, or bar	4
Salon	3
Community center	2
Laundry/dry cleaners	2
Museum	1
Doctor	1
Mailbox	1

5.1.3 Total Physical Activities of Older African American Women

Caloric expenditure/week/kg and frequency/week/kg of physical activity was measured by the modified version of CHAMPS and the results are summarized in Table 5-7. Caloric expenditure was computed by multiplying the corresponding MET value with the duration of each item, and frequency was simply summed up. Two levels of physical activity were calculated based on the adjusted MET value; all physical activities included 21 items, and moderate-intensity physical activity (Adjusted MET > 3.0) included 14 items. The number of samples for each statistic varied because some respondents missed either the frequency or duration of one or two of the items of physical activities. At this step, respondents' physical activities with missing values were not included.

Table 5-7

The Level of Physical Activity among Older African American Women Measured by the Modified CHAMPS

	N	Range	Mean(SD)	Skewness	Kurtosis
Caloric Expenditure/week in all physical activities (Kcal* $Kg^{-1} * wk^{-1}$)	73	0-90.42	19.98 (17.05)	1.78	4.22
Caloric Expenditure/week in moderate-intensity physical activities (Kcal* $Kg^{-1} * wk^{-1}$)	76	0-74.48	9.23 (12.96)	2.79	10.26
Frequency/week in all physical activities	71	0-62.00	14.08(10.89)	1.82	5.15
Frequency/week in moderate-intensity physical activities	77	0-29.00	4.13(5.62)	2.47	7.46

The mean caloric expenditures per week per kilogram in all physical activities and moderate-intensity physical activity were 19.98 and 9.23, respectively. About 89% of older African American women expended less than 40 calories per week engaging in all physical activities (see Figure 5-5). On the other hand, 24 out of 76 older African American women did not participate in any type of moderate-intensity physical activity. The mean frequencies per week of all physical activities and moderate-intensity physical activity were 14.08 and 4.13, respectively.

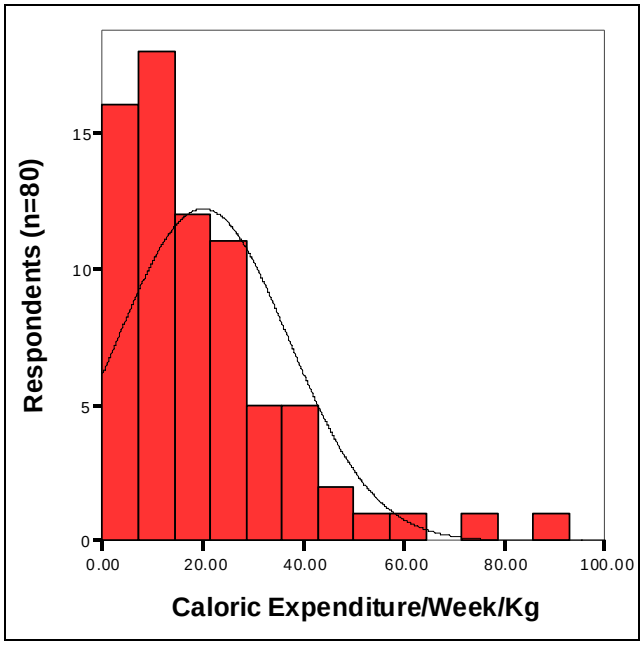


Figure 5-5 Caloric Expenditure/wk/kg in All Physical Activities

The national recommendations for physical activity advise participation in at least 30-minute of moderately intense activity at least five days a week, which is 5.513kcal/wk/kg based on the calculation. Results showed that 39 older African

American women (49%) meet the national recommendations (see Figure 5-6) and approximately 30% of older African American women did not participate in any types of moderate-intensity physical activity.

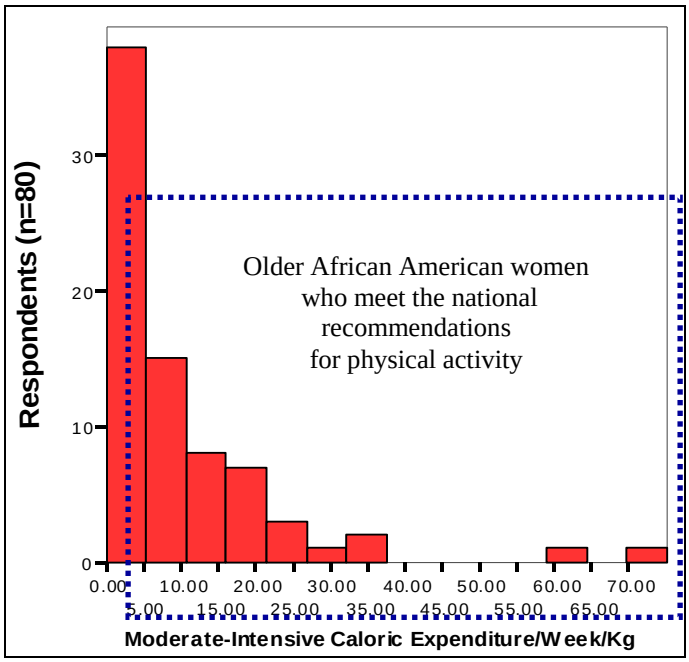


Figure 5-6 Caloric Expenditure/wk/kg in Moderate-Intensity Physical Activities

5.1.4 Relationship between Total Physical Activities and Characteristics of Samples

1) Relationships Between Total Physical Activities and Demographics, and Physical Health Status of Samples

Table 5-8 presents the correlation between the total physical activities (both caloric expenditures/week and frequency/week in all physical activities), the demographic characteristics and the physical health status of the samples.

The caloric expenditure/week was highly associated with the frequency/week (r=.79) (see Figure 5-7). The caloric expenditure/week in all physical activities was significantly correlated with the SRHI (r = .36), the HCI (r = .32), number of household members (r=.34), and alcohol drinks (r=.21). The frequency/week in all physical activities was associated with the SRHI (r=.29), number of household members (r=.27), and residency years (r=.20). The SRHI and number of household members were correlated with both types of physical activities, but correlations were relatively weaker with frequency/week than with caloric expenditure.

Figure 5-7 Correlation between Two Types of All Physical Activities

Table 5-8

Correlations between Caloric Expenditure/week/kg in All Physical Activity and Characteristics of Samples

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CE	1																
FPA	.79***	1															
SRHI	.36**	.29**	1														
HBI	-.19	-.19	-.38**	1													
HCI	.32**	.17	.60***	-.45***	1												
Smoke	-.03	-.09	.02	.00	-.14	1											
Drinks	.21†	.18	.30**	-.22†	.28*	-.09	1										
Age	-.15	-.10	-.29**	.15	-.30**	.26*	-.16	1									
Height	.06	.06	-.02	-.17	.14	-.09	.18	-.33**	1								
Weight	-.13	-.14	-.21†	-.04	-.02	-.02	-.14	-.29*	.44**	1							
Employment	.04	.15	-.27*	.15	-.34**	.21†	-.14	.61***	-.30*	-.25*	1						
Marital	.13	.05	.18	-.22*	.28*	-.04	.19	-.21†	-.08	-.14	-.05	1					
Education	.06	.12	.24*	-.24*	.16	.07	.18	-.17	.06	-.05	-.16	.15	1				
Income	.11	.05	.27*	-.18	.23*	.00	.35**	-.33**	-.03	.13	-.26*	.28*	.60***	1			
Car ownership	-.13	-.13	-.31*	.21†	-.24*	.03	-.10	.27*	-.06	-.07	.23*	-.07	-.29*	-.30*	1		
Household members	.34**	.27*	.11	.08	.15	-.01	-.02	-.07	.14	.04	.03	.29*	-.14	-.13	.02	1	
Residence years	.03	.20†	-.12	-.01	-.23*	.20†	-.12	.42***	-.23*	-.10	.43***	.01	.01	.07	.09	.03	1

Note. †$p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

CE: Caloric Expenditure/week in all physical activity/FPA: Frequency/week in all physical activity/Smoke:Smoking Behavior/ Drinks:Alcohol Drinking Behavior

2) Relationships between Total Physical Activities and Medical Problems

The correlation between the two types of total physical activities and medical problems reported by respondents are shown in Table 5-9.

Among the list of medical problems, back problems (r= - .28), hypertension (r= - .26), heart troubles (r= -.23) and chronic bronchitis (r= -.19) were all negatively associated with the caloric expenditure/week in all physical activities. On the other hand, frequency/week in all physical activities was correlated with back problems (r= - .22) and cancer (r= .22). Differing from other types of medical problems, cancer was revealed as positively being associated with frequency/week week in all physical activities.

The correlation results showed that back problems were positively associated with several types of diseases; the back problems were significantly related with Diabetes, Stroke, Arthritis and Fibromyalgia (r = .24 ~ .29) and also marginally with Hypertension (r=.22) and Heart Trouble (r=.20).

In addition, the table presented that the major four medical problems Hypertension, Heart Trouble, Chronic Bronchitis, and Back problems, decreasing older African American women's caloric expenditure/week/kg, were strongly positively correlated with each other.

Table 5-9

Correlations between Caloric Expenditure/week/kg in All Physical Activity and Medical Problems of Samples

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CE	1																		
FPA	.79***	1																	
Eyesight	.12	.09	1																
Hearing	.02	.04	.24*	1															
Diabetes	-.06	.02	-.12	.05	1														
Hypertension	**-.26***	-.17	-.06	-.14	.27*	1													
Heart trouble	**-.23†**	-.14	-.08	-.13	.07	**.19†**	1												
Stroke	-.08	-.07	-.25*	.06	.02	.08	.08	1											
Arthritis	-.13	-.07	-.15	.10	.18	.37**	.24*	.16	1										
Asthma	-.10	-.07	.08	.07	-.02	.10	-.11	-.05	-.05	1									
Chronic bronchitis	**-.19†**	-.16	-.19†	-.13	-.03	.14	**.29***	.15	.10	.11	1								
Osteoporosis	-.06	.08	-.04	.13	.23*	.17	-.09	.11	.25*	-.09	-.01	1							
Cancer	.01	.22†	-.04	-.06	.06	-.04	.02	-.05	-.11	-.06	.26*	.05	1						
Liver trouble	-.06	.(a)	.04	.04	-.07	.05	-.05	-.02	.09	-.03	-.04	.28*	.44***	1					
Fibromyalgia	-.14	-.15	-.02	-.18	.24*	.12	.12	.19†	.14	-.07	-.09	.16	-.07	-.03	1				
A broken hip or bones	.06	.09	.08	.07	.11	.10	.05	-.05	.19†	-.05	-.08	.41**	.18	.49***	.15	1			
Back problems	**-.28***	-.22†	-.21†	-.02	.29*	**.22†**	**.20†**	.23*	.29*	-.20†	-.03	.10	-.12	-.10	.24*	.03	1		
Anemia	-.09	-.08	-.13	-.18	.13	.12	.12	-.06	-.06	.15	.38**	-.11	.32**	-.03	.10	-.07	-.05	1	
Lung disease	-.08	-.03	.04	.04	.18	.05	.24*	-.02	.09	-.03	-.04	-.04	-.03	-.01	.40***	-.03	.13	-.03	1

Note. †$p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

CE: Caloric Expenditure/week in all physical activity/ FPA: Frequency/week in all physical activity

5.2 PART I1. The Effects of Physical Environments on Caloric Expenditure/week/kg in All Physical Activities among Older African American Women.

5.2.1 Characteristics of Physical Environments

Table 5-10 presents the characteristics of the physical environments in which the study samples resided. The descriptive statistics of the physical environmental variables were described by dividing them into three groups: two variable groups were nearby home level (0.5 mile street distance boundary) and neighborhood level (1 mile street distance boundary) and the other variable group was accessibility.

Physical environments where older African American women who participated in this study lived were represented with a higher mean intersection density and a highly mixed land use in both the nearby home and neighborhood environments. However, the mean of the park/open space density and the cul-de-sac density, and the average number of accessible parks/open spaces were relatively low in both environments. The mean of the greenery density was similar within the two environments, whereas the mean of the street greenery density was higher in the neighborhood, rather than in the nearby home environment.

The mean street distance to the closest park, church, and commercial centers was less than 0.4 miles, while the mean street distance to the closest school was a bit further, 0.51 miles.

Table 5-10

Descriptive Statistics of Physical Environments (N=80)

	Range	Mean (SD)	Skewness	Kurtosis
Nearby Home Environments (0.5 mile street distance boundary)				
Sidewalk Density	.00 - 1.32	.51 (.23)	.40	1.50
Intersection Density	2.42 - 14.87	10.23 (2.43)	-.38	-.22
Cul-de-sac Density	.00 - 5.74	1.68 (1.79)	1.00	-.49
Street Density	.01 - .04	.03 (.01)	-.53	-.68
Park/Open space Density	.00 - .20	.04 (.06)	1.27	.24
Number of accessible Park/Open space	.00 - 3.00	.91 (.66)	.37	.36
Greenery Density	.32 - .68	.50 (.06)	.92	2.23
Street Greenery Density	.10 - .27	.18 (.03)	.20	.07
Commercial Area Density	.00 - .32	.05 (.07)	2.35	5.95
Land-Use Mix	.23 - .93	.69 (.12)	-.94	1.49
Neighborhood Environments (1 mile street distance boundary)				
Sidewalk Density	.00 - 1.07	.47 (.14)	-.08	6.23
Intersection Density	6.07 - 12.82	10.06 (1.20)	-1.22	2.47
Cul-de-sac Density	.20 - 3.17	1.15 (.75)	.74	-.38
Street Density	.01 - .03	.02 (.01)	-.17	-1.55
Park/Open space Density	.00 - .17	.03 (.02)	3.17	16.69
Number of accessible Park/Open space	1.00 - 10.00	3.09 (2.10)	1.69	3.00
Greenery Density	.21 - .62	.49 (.06)	-.54	3.14
Street Greenery Density	.08 - .20	.16 (.03)	-.42	-.97
Commercial Area Density	.00 - .26	.07 (.06)	.86	.92
Land-Use Mix	.63 - .87	.77 (.06)	-.36	.00
Accessibility				
Street Distance to the closest Park/Green Area	.01 - 1.16	.36 (.24)	1.08	.80
Street Distance to the closest School	.04 - 2.08	.51 (.38)	1.65	4.16
Street Distance to the closest Church	.01 - 1.40	.24 (.24)	1.95	6.04
Street Distance to the closest Commercial Area	.01 - 1.09	.37 (.34)	.67	-1.07

Most variables represented well the environmental characteristics of the nearby downtown Bryan area, from which the study samples were selected. A few variables with either a higher kurtosis or a higher skewness (see Figures 5-8, 5-9 and 5-10) showed extreme environments where respondents lived (either right downtown or much further away from downtown).

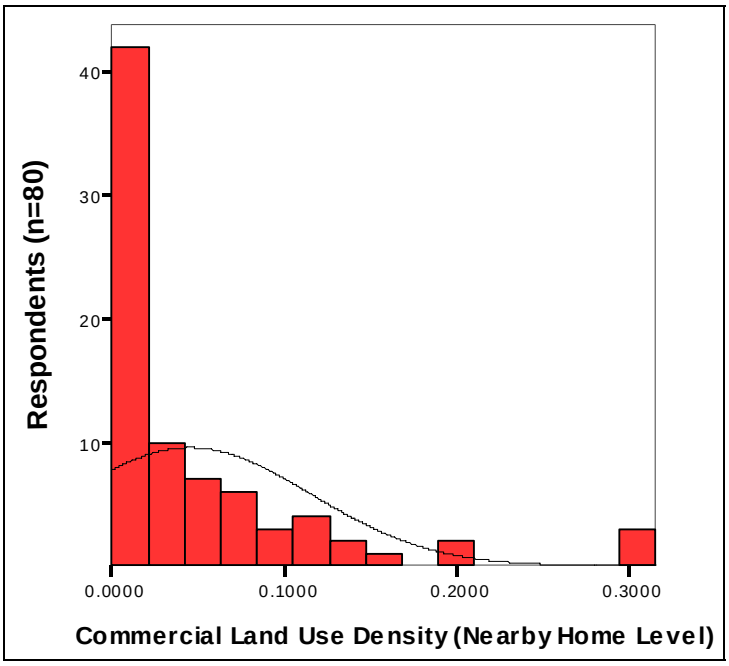


Figure 5-8 Distribution of Commercial Land Use Density in Nearby Home Level

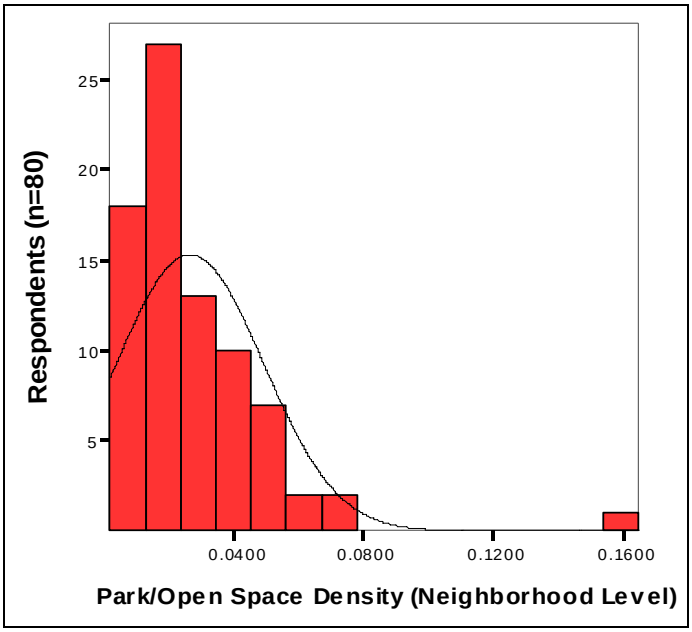


Figure 5-9 Distribution of Park/Open Space Density in Neighborhood Level

Figure 5-10 Distribution of Street Distance to the Closest Church

5.2.2 Relationship between Physical Environments and Caloric Expenditure/week/kg in All Physical Activities.

The correlation between the caloric expenditure/week in all physical activities and the physical environmental variables in the areas nearby home and the neighborhood are shown in Tables 5-11 and 5-12, respectively. Among the variables in the nearby home environment, the caloric expenditure/week in all physical activities was associated most significantly with greenery density (r=.28), and marginally associated with street greenery density (r=.19). Both greenery and street greenery density had a positive correlation to physical activities among older African American women.

Several sociodemographic characteristics of respondents were associated with physical environmental variables. The married older African American women were found to reside in the areas having more green/open spaces and greenery, and less intersections and streets than those who were not married. Also, the houses of the married older women were further away from schools. Highly educated older women lived in the places surrounded by more greenery and more commercial land use, but with less intersections and streets. Their houses were located further away from parks. The higher household incomes the older women had, they lived in the places with more cul-de-sacs, greenery and commercial land use, but less intersections.

In addition, older African American women who drank alcohol 1-5 times/week lived in the places having more greenery, street greenery, commercial land use, but less mixture of land use and a fewer accessible number of green spaces.

Table 5-11

Correlations between Caloric Expenditure/week/kg, and Personal and Environmental Variables in Nearby Home Level

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CE	1															
Age	-.23	1														
Height	.10	-.33**	1													
Weight	-.10	-.29*	.45***	1												
Employment	-.001	.61***	-.30**	-.25*	1											
Marital	.12	-.22†	-.08	-.14	-.05	1										
Education	.08	-.17	.06	-.05	-.16	.15	1									
Income	.13	-.33**	-.03	.14	-.26*	.28*	.60***	1								
Car ownership	**-.21†**	.27*	-.06	-.07	.23*	-.07	-.29*	-.30**	1							
Members	**.31****	-.07	.14	.04	.03	.29*	-.14	-.13	.02	1						
Residence years	.02	.42***	-.23*	-.10	.43***	.01	.01	.07	.09	.03	1					
SRHI	**.39****	-.29**	-.02	-.21†	-.27*	.18	.24*	.27*	-.31**	.11	-.12	1				
HBI	-.19	.15	-.17	-.04	.15	-.22	-.24*	-.18	.21†	.08	-.01	-.38**	1			
HCI	**.31****	-.30**	.14	-.02	-.34**	.28*	.16	.24*	-.24*	.16	-.23*	.60***	-.45***	1		
Smoke	-.04	.26*	-.09	-.02	.21†	-.04	.07	-.00	.03	-.01	.20†	.02	.00	-.14	1	
Drinks	**.25***	-.16	.18	-.15	-.14	.19	.18	.35**	-.10	-.02	-.12	.30*	-.22†	.29*	-.09	1
H_SW_DE	-.15	-.07	-.07	-.08	.02	-.04	.00	-.12	.05	-.04	-.13	**-.21†**	.06	**-.21†**	.11	-.01
H_INT_DE	.12	.01	**.21†**	.14	-.03	**-.35****	**-.22***	**-.36****	.07	.00	-.11	.04	.02	-.02	.09	.07
H_CDS_DE	.01	-.03	-.14	-.12	.09	.09	.15	**.22†**	-.16	.05	**.23***	.08	.02	.06	**-.20†**	-.06
H_ST_DE	-.02	-.07	.03	.13	-.13	**-.34****	**-.33****	-.20	.19	-.07	-.14	-.11	.01	-.06	-.04	-.10
H_PAK_DE	-.11	-.03	-.10	.07	.12	**.19†**	.03	.11	-.16	.08	**.23***	-.03	-.08	-.04	-.05	-.19
H_GR_DE	**.28***	-.04	.02	-.05	.07	**.24***	**.31****	**.33****	-.07	-.10	-.05	**.20†**	-.14	.15	-.07	**.31****
H_STGR_DE	.19	-.09	.02	.05	-.12	-.20	.03	.09	.07	-.12	-.16	.09	-.11	.03	-.03	**.22†**
H_COM_DE	-.01	.03	-.01	.08	-.11	.05	**.38****	**.23***	-.08	.01	.02	-.04	-.08	-.07	.08	**.20†**
H_LUM	-.01	.09	-.05	.04	.03	-.00	.03	-.11	.08	.06	**.22†**	-.14	-.04	-.12	**.19†**	**-.23***
H_N_PARK	-.05	.06	-.08	-.02	.05	.05	-.11	-.04	-.01	.09	.13	-.12	.02	**-.21†**	.01	**-.28***
SD_COM	-.04	-.06	-.13	-.08	.07	.08	-.14	.04	-.01	.04	.03	.08	-.04	.12	-.18	-.03
SD_PARK	-.05	.08	.03	-.09	.06	-.04	**.24***	.08	-.02	-.13	-.06	.10	.03	.18	-.08	.21
SD_SCHOOL	.04	.08	-.03	-.06	.06	**.25***	.11	.16	-.08	.05	.14	.10	-.12	.09	-.13	-.07
SD_CHURCH	-.00	-.02	-.15	-.15	.05	-.00	.16	.15	-.05	-.16	.07	.14	-.01	.08	-.09	.04

Table 5-11 Continued

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
H_SW_DE	1													
H_INT_DE	.05	1												
H_CDS_DE	-.20†	-.60***	1											
H_ST_DE	.19†	.35**	-.33**	1										
H_PAK_DE	-.02	-.63***	.57***	-.26**	1									
H_GR_DE	-.23*	-.10	.07	-.37**	-.17	1								
H_STGR_DE	.09	.44***	-.47***	.62***	-.59***	.32**	1							
H_COM_DE	.00	.07	-.30**	-.36**	-.33**	.15	.11	1						
H_LUM	-.15	.20†	-.14	-.22*	-.11	-.09	-.15	.53***	1					
H_N_PARK	.21†	-.11	-.07	.17	.26*	-.11	.04	-.17	.07	1				
SD_COM	-.09	-.42***	.67***	.13	.52***	-.03	-.24*	-.74***	-.43***	-.02	1			
SD_PARK	-.12	.09	.08	-.28*	-.38**	.28*	-.02	.25*	-.08	-.70***	-.11	1		
SD_SCHOOL	-.49***	-.40***	.53***	-.33**	.28*	.33**	-.24*	-.13	.00	-.08	.42***	.02	1	
SD_CHURCH	.14	-.46***	.57***	-.14	.28*	.03	-.22†	-.25*	-.44***	-.14	.41***	.12	.38**	1

Note. †$p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

CE: Caloric Expenditure/week in all physical activity/ Members:Household Members/ SW_DE: Sidewalk Density/ INT_DE: Intersection Density/CDS_DE:Cul-De-Sac Density/ ST_DE:Street Density/PAK_DE:Density of Green Space/GR_DE: Greenery Density/STGR_DE:Street Greenery Density/COM_DE:Commercial Land Use Density/ LUM:Land Use Mix/N_PARK:Number of Accessible Parks/ SD_COM:Street Distance to the Closest Commercial Land Use/ SD_PARK:Street Distance to the Closest Green Open Space/ SD_SCHOOL:Street Distance to the Closest School/ SD_CHURCH Distance to the Closest Church

In the neighborhood environment, park/open space density (r= -.21) was the only significantly correlated variable with the caloric expenditure/week in all physical activities. Park/open space density within the neighborhood environment was found to have a negative effect on total physical activities.

The correlations between sociodemographic characteristics of respondents and physical environments in neighborhood level showed similar patterns with those in the nearby home level. The married older African American women were likely to live in the places representing with more greenery and cul-de-sacs, but with less intersections, streets, and street greenery. Also, their houses were located further away from schools. Highly educated older African American women lived in the places having more cul-de-sacs and greenery, but with less intersections and streets, and their houses were located further away from green/open spaces. When older African American women reported higher household incomes, they lived in the places with more cul-de-sacs and greenery, but less intersections and streets.

Differ from the previous correlation table, alcohol drinking behavior was only marginally associated with the distance to green spaces, that is to say, older African American women who drank alcohol 1-5 times per week lived in the places having a fewer accessible number of green/open spaces.

Table 5-12

Correlations between Caloric Expenditure/week/kg and Personal and Environmental Variables in Neighborhood Level

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CE	1															
Age	-.23	1														
Height_	.10	-.33**	1													
Weight	-.10	-.29*	.45***	1												
Employment	-.01	.61***	-.30**	-.25*	1											
Marital	.12	-.22	-.08	-.14	-.05	1										
Education	.08	-.17	.06	-.05	-.16	.15	1									
Income	.13	-.33**	-.03	.14	-.26*	.28*	.60***	1								
Car Ownership	-.21†	.27*	-.06	-.07	.23*	-.07	-.29*	-.30**	1							
Members	.31**	-.07	.14	.04	.03	.29*	-.14	-.13	.02	1						
Residence years	.02	.42***	-.23*	-.10	.43***	.01	.01	.07	.09	.03	1					
SRHI	.39**	-.29**	-.02	-.21†	-.27*	.18	.24*	.27*	-.31**	.11	-.12	1				
HBI	-.19	.15	-.17	-.041	.15	-.22†	-.24*	-.18	.21	.08	-.01	-.38**	1			
HCI	.31**	-.30**	.14	-.02	-.34**	.28*	.16	.24*	-.24*	.16	-.23*	.60***	-.45***	1		
Smoke	-.04	.26*	-.09	-.02	.21†	-.04	.07	-.00	.03	-.01	.20†	.02	.00	-.14	1	
Drinks	.25*	-.162	.18	-.15	-.14	.19	.18	.35**	-.10	-.02	-.12	.30*	-.22†	.29*	-.09	1
M_SW_DE	-.13	-.08	-.05	.03	-.05	-.11	-.14	-.14	**.26***	-.01	**-.19†**	**-.30****	.12	**-.22***	.02	-.06
M_INT_DE	.08	.00	.10	.09	.02	**-.29****	**-.23***	**-.33****	.13	.01	-.04	-.18	.00	-.08	-.07	-.18
M_CDS_DE	.03	-.05	-.10	-.15	.06	**.21†**	**.29***	**.30****	-.16	.02	.07	.11	-.03	.12	-.21	.19
M_ST_DE	.05	.01	.14	.14	-.05	**-.32****	**-.22†**	**-.26***	.18	-.01	-.08	-.07	.06	-.08	.08	-.03
M_PAK_DE	**-.21†**	-.04	-.10	-.08	-.08	.10	-.02	.01	.01	.00	-.11	-.07	.15	-.03	-.06	-.15
M_GR_DE	-.05	-.07	-.08	-.13	.07	**.36****	**.25***	**.31****	-.09	-.02	.06	.04	-.05	.08	-.15	.06
M_STGR_DE	.06	.01	.13	.08	-.04	**-.24***	-.05	-.13	.18	-.03	-.11	-.03	.03	-.05	.00	.09
M_COM_DE	.06	.05	-.03	.05	.00	.02	.09	.03	-.11	.07	.06	-.02	-.07	-.06	.20	.04
M_LUM	-.12	.10	-.07	.02	.16	.01	-.02	-.06	-.08	.09	**.23***	-.21	.05	**-.22†**	.14	-.06
M_NPA	-.18	.16	.02	.02	-.00	-.06	-.03	-.03	.26*	-.12	.04	**-.22†**	.00	-.14	.00	-.04
SD_COM	-.04	-.06	-.13	-.08	.07	.08	-.14	.04	-.01	.04	.03	.08	-.04	.12	-.18	-.03
SD_PARK	-.05	.08	.03	-.09	.06	-.04	**.24***	.08	-.02	-.13	-.06	.10	.03	.18	-.08	**.21†**
SD_SCHOOL	.04	.08	-.03	-.06	.06	**.25***	.11	.16	-.08	.05	.14	.10	-.12	.09	-.13	-.07
SD_CHURCH	-.00	-.02	-.15	-.15	.05	-.00	.16	.15	-.05	-.16	.07	.14	-.01	.08	-.09	.04

Table 5-12 Continued

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
M_SW_DE	1													
M_INT_DE	.30**	1												
M_CDS_DE	-.08	-.35**	1											
M_ST_DE	.28*	.38**	-.72***	1										
M_PAK_DE	.46***	-.08	.35**	-.32**	1									
M_GR_DE	-.03	-.39***	.80***	-.69***	.38***	1								
M_GRST_DE	.29*	.28*	-.59***	.92***	-.30**	-.50***	1							
M_COM_DE	-.28*	-.19†	-.42***	-.01	-.33**	-.49***	-.02	1						
M_LUM	.03	.13	-.24*	-.07	-.13	-.30**	-.18	.52***	1					
M_N_PARK	.34**	.07	-.47***	.49***	-.05	-.18	.57***	-.02	.12	1				
SD_COM	.13	.08	.61***	-.33**	.32**	.54***	-.38**	-.76***	-.30**	-.32**	1			
SD_PARK	-.27*	-.07	.23*	.00	-.29*	-.02	.08	.06	-.04	-.20†	-.11	1		
SD_SCHOOL	-.34**	-.25*	.51***	-.57***	-.04	.39***	-.54***	-.12	-.16	-.33**	.42***	.02	1	
SD_CHURCH	.06	-.32**	.66***	-.37**	.37**	.47***	-.31**	-.33**	-.26*	-.19†	.41***	.12	.38**	1

Note. †$p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

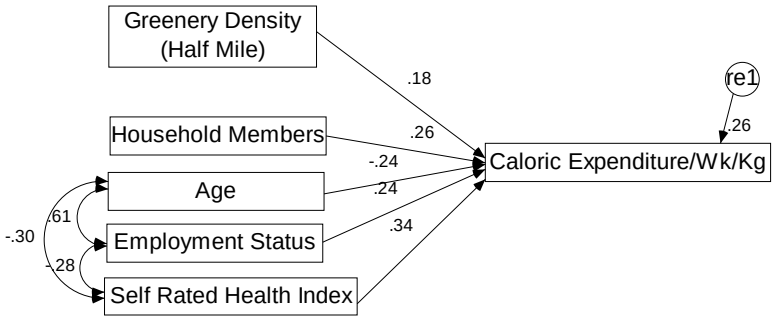
CE: Caloric Expenditure/week in all physical activity/ Members: Household Members/ SW_DE: Sidewalk Density/ INT_DE: Intersection Density/CDS_DE:Cul-De-Sac Density/ ST_DE:Street Density/PAK_DE:Density of Green Space/GR_DE: Greenery Density/STGR_DE:Street Greenery Density/COM_DE:Commercial Land Use Density/ LUM:Land Use Mix/N_PARK:Number of Accessible Parks/ SD_COM:Street Distance to the Closest Commercial Land Use/ SD_PARK:Street Distance to the Closest Green Open Space/ SD_SCHOOL:Street Distance to the Closest School/ SD_CHURCH Distance to the Closest Church

5.2.3 Physical Environmental Effects on Total Physical Activities among Older African American Women

1) Nearby Home Levels

In the correlation table, greenery and street greenery density were expected to have positive effects on the total physical activities. In this section, the effects of nearby home environments and accessibility variables were tested using three imputed data in path models. In Figure 5-11, the level of statistical significance (*p*-value) of all three path models was at least larger than .24. Given these results, these models were acceptable, as the null hypothesis would not need to be rejected. The goodness-of-fit indices for all three models was also satisfied with acceptable levels according to a rule of thumb; CFI > .90 indicates a reasonably good fit (Hu & Bentler, 1999) and the value of RMSEA falling between .05 and .80 suggests a reasonable error of approximation (Browne & Cudeck, 1993).

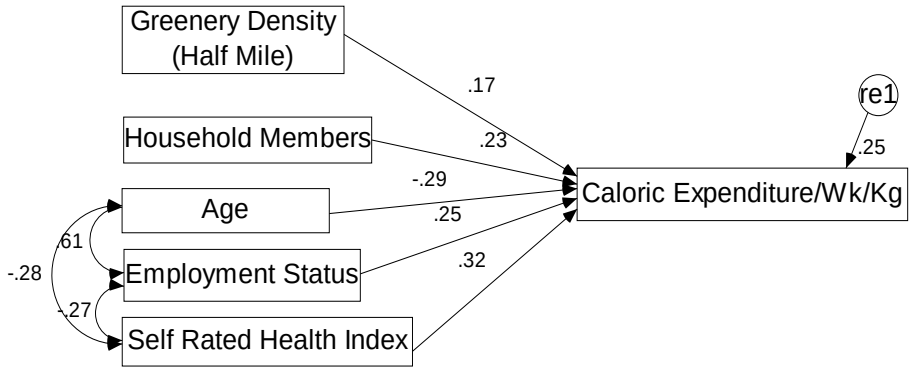
Model 1



Chi-square = 7.65 (df = 7), *p* =.36, CFI = .99, RMSEA = .03

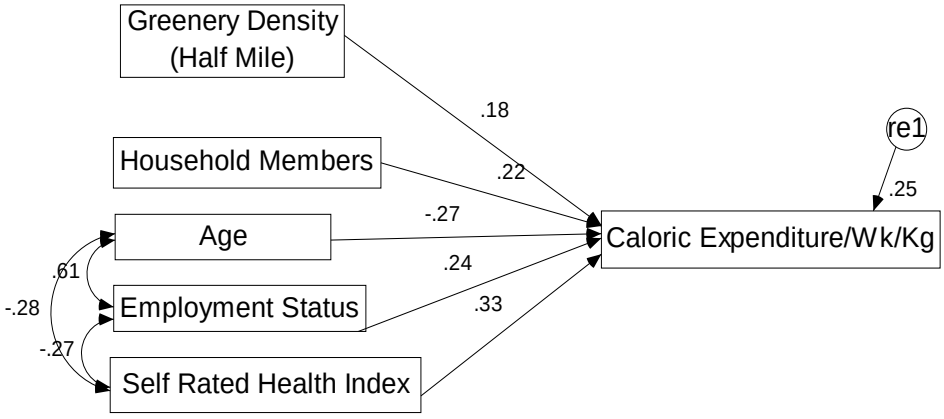
Figure 5-11 Path Models Using Three Imputed Datasets in Nearby Home Level

Model 2



Chi-square = 9.12 (df = 7), *p* =.24, CFI = .97, RMSEA = .06

Model 3



Chi-square = 7.98 (df = 7), *p* =.34, CFI = .99, RMSEA = .04

Figure 5-11 Continued

Note: CFI = Comparative Fit Index, RMSEA = Root Mean Square Error of Approximate

The squared multiple correlations (R^2_{smc}) of the three models were .26, .25 and .25, respectively. Hence, based on the given results, greenery density, age, employment status, household members and the Self Rated Health Index (SRHI) accounted for about 25% of the variances in the squared root of the total physical activities among older African American women.

The combined path coefficients and standard errors of each parameter, as well as the *p-values,* are summarized in Table 5-13. In the nearby home environment, greenery density (B= 4.99, p <.10) had a positive effect on total physical activity. Among the samples' demographic characteristics and physical health status, a younger age (B = -.58, p <.05), more household members (B = .32, p <.05), less engaged in working (B = .48, p <.05), and higher self-rated health status (B = .27, p <.001) affected significantly, resulting in increasing total physical activities.

Table 5-13

The Combined Path Coefficients Predicting Caloric Expenditure/week/kg in All Physical Activities in Nearby Home Level

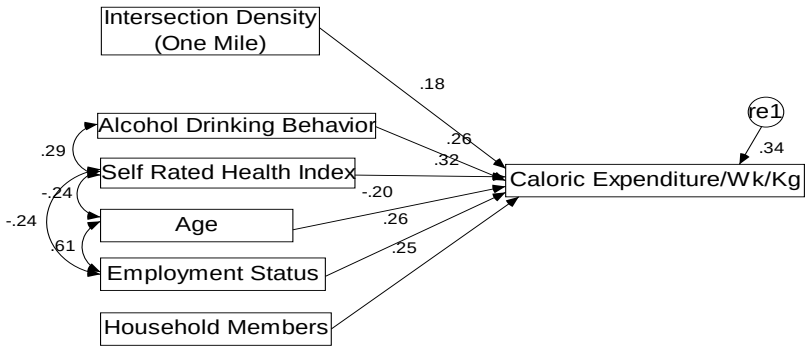
	Unstandardized Parameter Estimates	S.E.	T-ratio	*p-value*
Greenery Density	4.99	2.72	1.84	.07†
Age	-.58	.03	-2.08	.04*
Employment Status	.48	.25	1.95	.05*
Household Members	.32	.13	2.40	.02*
Self Rated Health Index (SRHI)	.27	.09	3.18	.00***

Note. †p < .10, * p < .05, *** p < .01

2) Neighborhood Level

In this section, neighborhood environmental variables and accessibility variables were tested using three imputed data in the path models (see Figure 5-12). Although park/open space density was significantly associated with total physical activities in the correlation table, its effect did not appear in the path models. Intersection density was unexpectedly revealed to be a significant variable in neighborhood environment with β = .18 (p =.05) in model 1 and β = .16 (p =.10) in model 2. In model 3, intersection density was not statistically significant. Unlike intersection density, the alcohol drinking behavior was significant in model 1 (β = .50, p =.01) and model 3 (β = .55, p = .07). The squared multiple correlations (R^2_{smc}) of the three models were .34, .29 and .30, respectively. Compared to the results of path models in nearby home environment, the value of R^2_{smc} were not consistent because the effects of intersection density and behavior regarding alcoholic drinks were not stable among three path models.

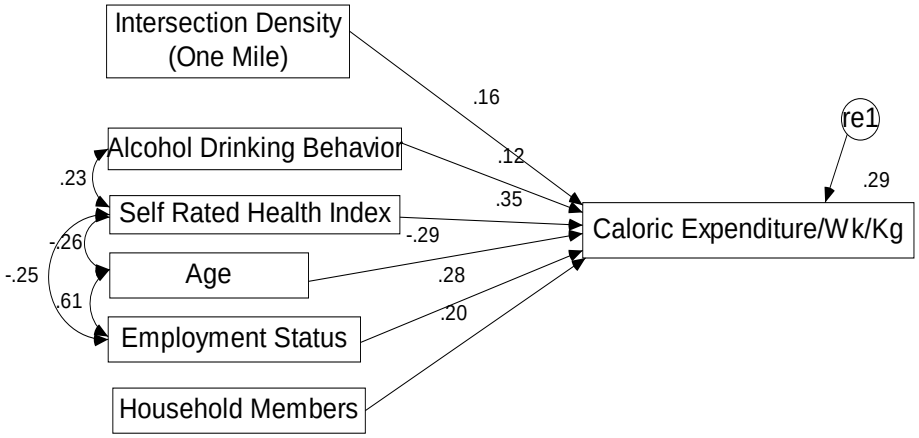
Model 1



Chi-square = 12.75 (df = 11), p =.31, CFI = .98, RMSEA = .05

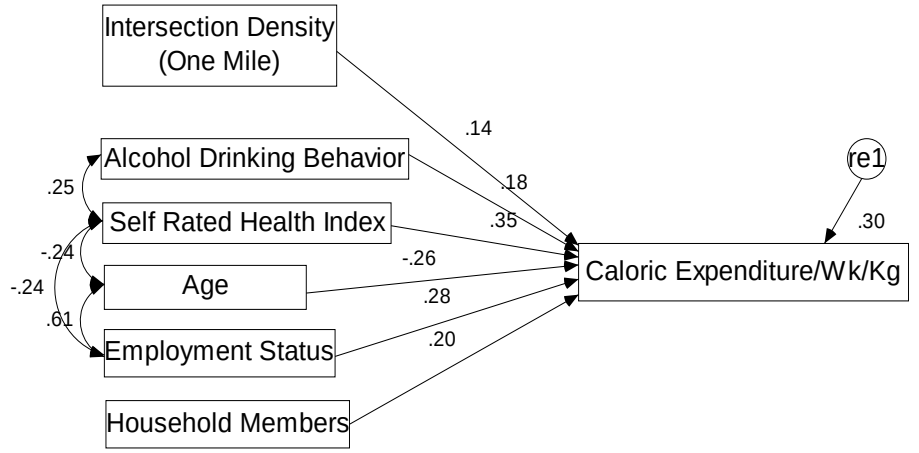
Figure 5-12 Path Models Using Three Imputed Datasets in Neighborhood Level

Model 2



Chi-square = 8.58 (df = 11), *p* =.66, CFI = 1.00, RMSEA = .00

Model 3



Chi-square = 9.04(df = 11), *p* =.62, CFI = 1.00, RMSEA = .00

Figure 5-12 Continued

Note: CFI = Comparative Fit Index, RMSEA = Root Mean Square Error of Approximate

The combined path coefficients of the six variables are shown in Table 5-14. Higher intersection density (B = .24, p =.10) in the neighborhood environment led to a higher level of engagement in physical activity among older African American women. Age, employment status, household members, and Self Rated Health Status were again included in the model as covariates. The alcohol drinking behavior appeared as a nonsignificant variable when the path coefficients of three models were combined.

Table 5-14

The Combined Path Coefficients Predicting Caloric Expenditure/week/kg in All Physical Activities in Neighborhood Level

	Unstandardized Parameter Estimates	S.E.	T-ratio	*p-value*
Intersection Density	.24	.14	1.66	.10†
Age	-.06	.03	-1.94	.06†
Employment Status	.55	.24	2.27	.02*
Household Members	.30	.13	2.21	.03*
Self Rated Health Index (SRHI)	.29	.09	3.37	.00***
Alcohol Drinking Behavior	.99	.66	1.50	.16

Note. †p < .10, * p < .05, *** p < .001

5.3 PART III: Mediating the Effects of Physical Environments and Caloric Expenditure/week/kg in All Physical Activities of Older African American Women

5.3.1 Descriptive Statistics and Factor Analysis of Psychological Well-being

The items marking psychological well-being and the number of positive responses to each item are presented in Figure 5-13. Among total nine questions, the "no" responses were considered positive answers to those six items asking questions in negative ways; for example, for the question of "*Do things keep getting worse as you get older?",* the answer of "No" was counted. On the contrary, in the three other items [the items with (I) in Figure 5-13] "yes" was directly counted.

A higher proportion of older African American women replied that they did feel less sadness (86.3%), loneliness (83.8%), and uselessness (73.8%) in their daily lives. However, to the questions regarding aging and its effects, less than 50% of older African American women reported positive answers; they did not feel things getting worse as they aged (48.8%), they were not bothered by little things (47.5%), and had as much pep as the previous year (42.5%).

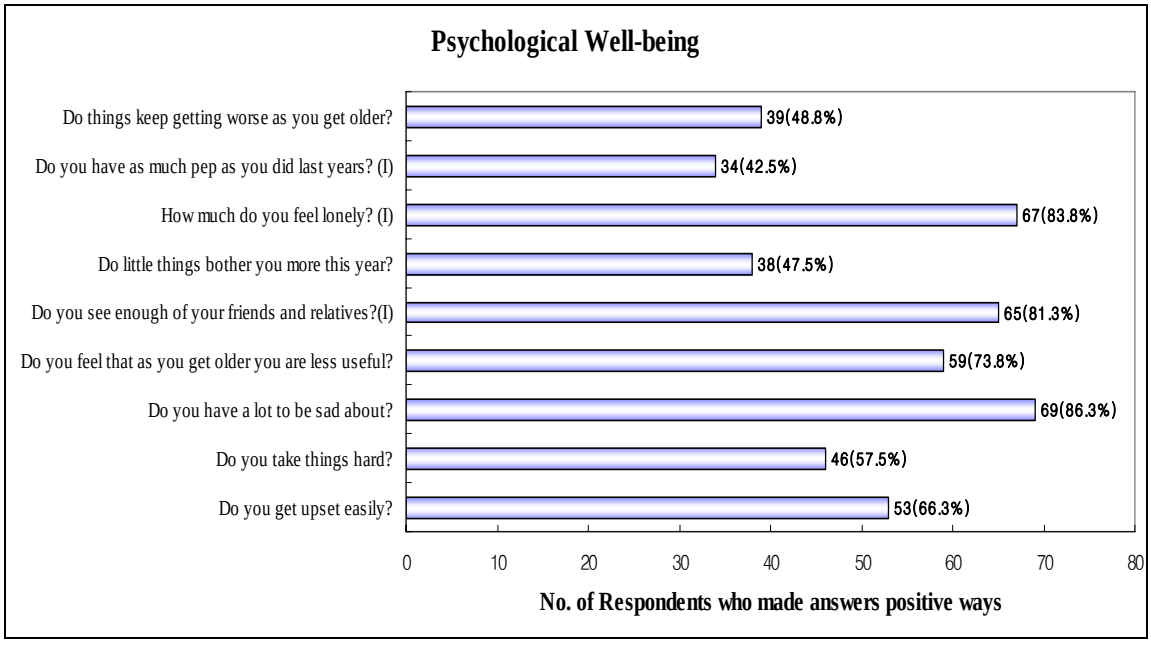


Figure 5-13 Responses to the Items in Psychological Well-being

Note: The inversed scores were counted for the statements with (I)

The exploratory factor analysis was proceeded and four factors were produced. The results of the factor analysis are not described because the shaped four factors did not satisfy the fit indices of the SEM measurement model. The SEM measurement model of psychological well-being started with four factors and terminated with a single factor. Figure 5-14 presents the results of a SEM measurement model of psychological well-being. The data was run only once because there was no missing value in this section. Values of selected fit indices were $\chi^2 = 24.89$, p=.41, CFI = .99, and RMSEA =.02. These results clearly indicate that the single factor model of psychological well-being explained well the obtained data, with a good fit.

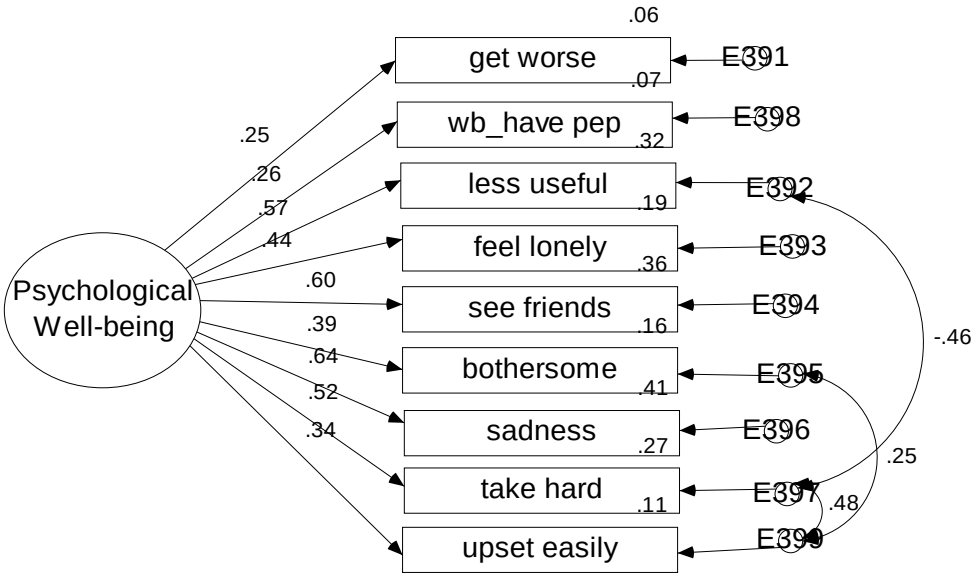


Figure 5-14 SEM Measurement Model for Psychological Well-being

Note: CFI = Comparative Fit Index, RMSEA = Root Mean Square Error of Approximation

5.3.2 Descriptive Statistics and Factor Analysis of Sense of Community Index

1) Descriptive Statistics

A total of 12 statements asking about the social environment in which older African American women resided and their responses to the statements regarding this issue are presented in Figure 5-15.

In general, respondents showed a positive reaction to their neighborhood. Especially, a high number of older African American women reported that they had social interaction (92.5%). They also expressed that the social atmosphere in their neighborhood was comfortable enough to feel like home (91.3%) and good to live in (87.5%), which might possibly lead one to expect a long residency (86.3%). In addition, 80% of respondents noticed the importance of living in a particular neighborhood. Meanwhile, a relatively small percentage of older African American women reported that they had influence over their neighborhood (53.8%) and shared the same values as their neighborhood (50%).

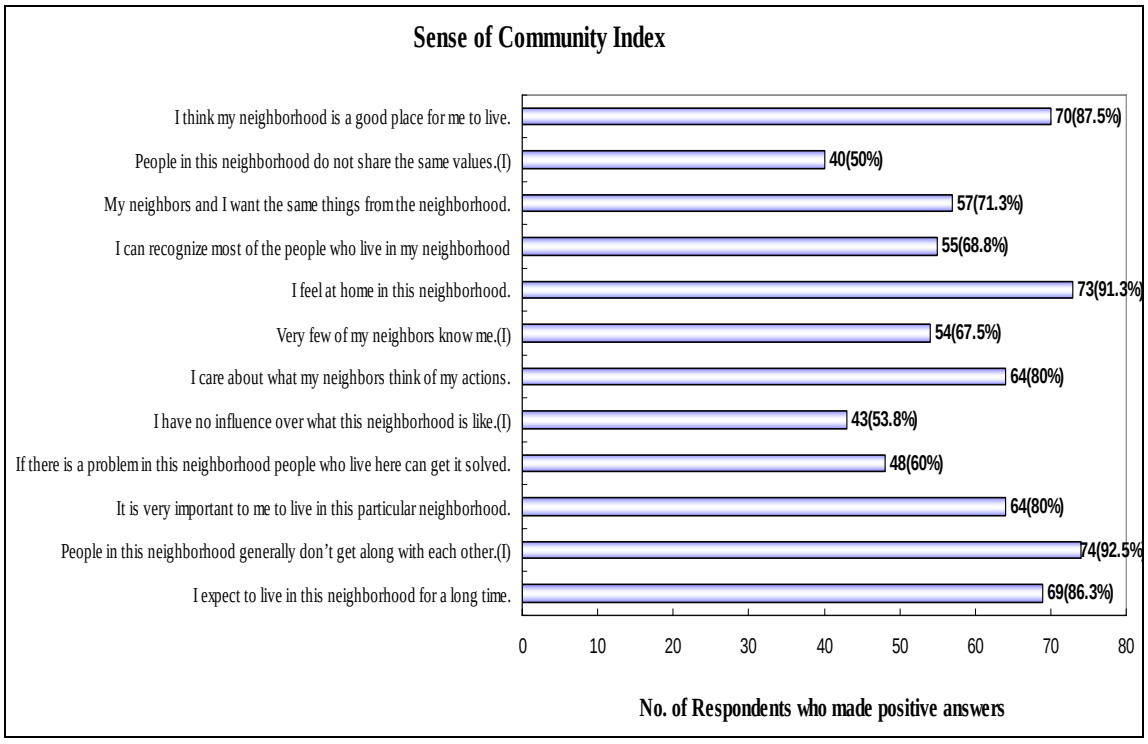


Figure 5-15 Number of Respondents Who Gave Positive Answers to Each Item

Note: The inversed scores were counted for the statements with (I)

2) Factor Analysis

McMillan & Chavis (1986) suggested four subscales: membership, influence, reinforcement of needs, and shared emotional connection. Although four factors were generated by an oblique rotation (promax), constructs were shaped with a different composition of the items (see Table 5-15). The first factor consisted of five items, with all three items of the reinforcement of needs (items 1, 2 and 3) and two items of influence (items 8 and 9). The second factor was composed of two items of shared emotional connection (items 10 and 12) and one item of membership (item 5). The third factor was formed of two items of membership (items 4 and 6) and the fourth factor consisted of one item of influence (item 7) and one item of shared emotional connection. The Cronbach's α of the first factor was .72, but the others were relatively low.

Table 5-15

Factor Loadings and Reliability of Sense of Community Index

	Factor 1	Factor 2	Factor 3	Factor 4
Good place to live	.689			
Share the same values	.633			
Want same things	.562			
Recognizing neighbors			.869	
Feel at home		.457		
Neighbors' recognition			.718	
Care about neighbors' thoughts				.793
Influence over the neighborhood	.836			
Solve problems	.710			
Importance of place		.498		
Get along with neighbors				.727
Expect to long residency		.928		
Eigenvalues	3.20	1.41	1.29	1.17
Percentage of Variance	26.65	11.78	10.79	9.73
Cronbach's Alpha	.72	.43	.57	.22

The correlations between the factors are shown in Table 5-16. Correlation coefficients between the factors ranged from -.23 to .35. According to the results, factor 1 had a positive, strong relation with factor 2, and factor 2 was negatively correlated with factor 4.

Table 5-16

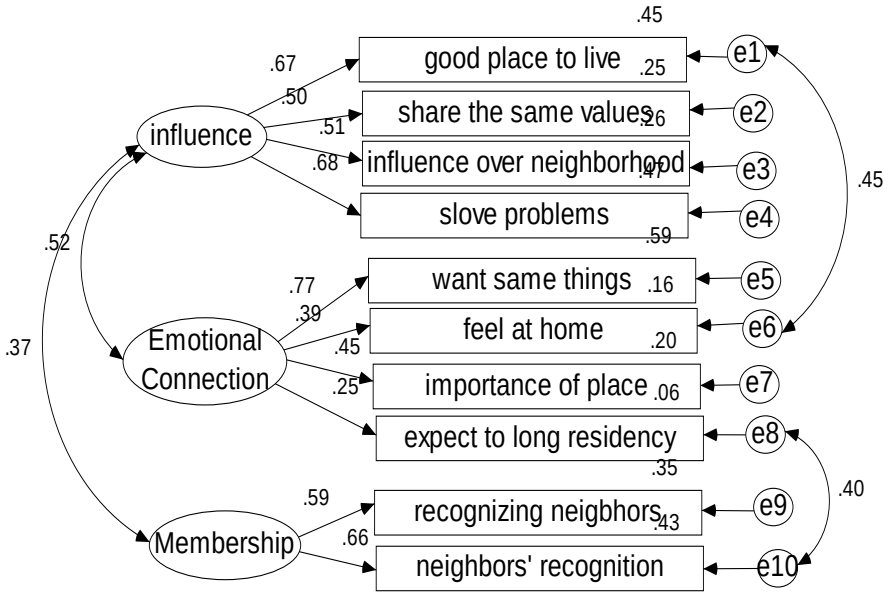
Intercorrelations among Four Factor Scores of Sense of Community Index

Component	Factor 1	Factors2	Factors3
Factor 2	.35		
Factor 3	.13	.05	
Factor 4	-.06	-.23	.18

Based on the factor analysis findings, the SEM measurement model of sense of community was undertaken (see Figure 5-16). Results showed that one item (item 3) was loaded under the other construct. In addition, two items (caring about neighbors' thoughts, and getting along with neighbors) were eliminated because the parameter estimates of the two items were not statistically significant at the level of $p < .10$, either as an independent factor or within any other factors.

The final SEM measurement model of sense of community was constructed with three factors: influence and reinforcement of needs, emotional connection, and membership. The factor of influence and reinforcement of needs was positively interrelated with both the factor of emotional connection (r = .52) and the factor of membership (r= .37).

The SEM measurement model was tested three times with the three imputed datasets. Only one of the models is presented here, since the goodness-of-fit and parameter estimates of the three models were similar. The values of the selected fit indices in the model below were χ^2 = 29.61, *p*=.31, CFI = 1.00, and RMSEA =.00, indicating a good fit of the data.



Chi-square = 29.61 (*df* = 31), *p-value* = .54, CFI = 1.00, RMSEA = .00

Figure 5-16 SEM Measurement Model of Sense of Community

Note: CFI = Comparative Fit Index, RMSEA = Root Mean Square Error of Approximation

5.3.3 Descriptive Statistics and Factor Analysis of Sense of Perception to Neighborhood Safety

1) Perception of Neighborhood Problems

Older African American women were asked to report their types of neighborhood problems, as many as they perceived that occurred in the area in which they resided. Among the total seven types of neighborhood problems, the most frequently reported problems were alcohol or drug use (53.8%), followed by burglary (27.5%) and gangs (18.8%) (see Figure 5-17).

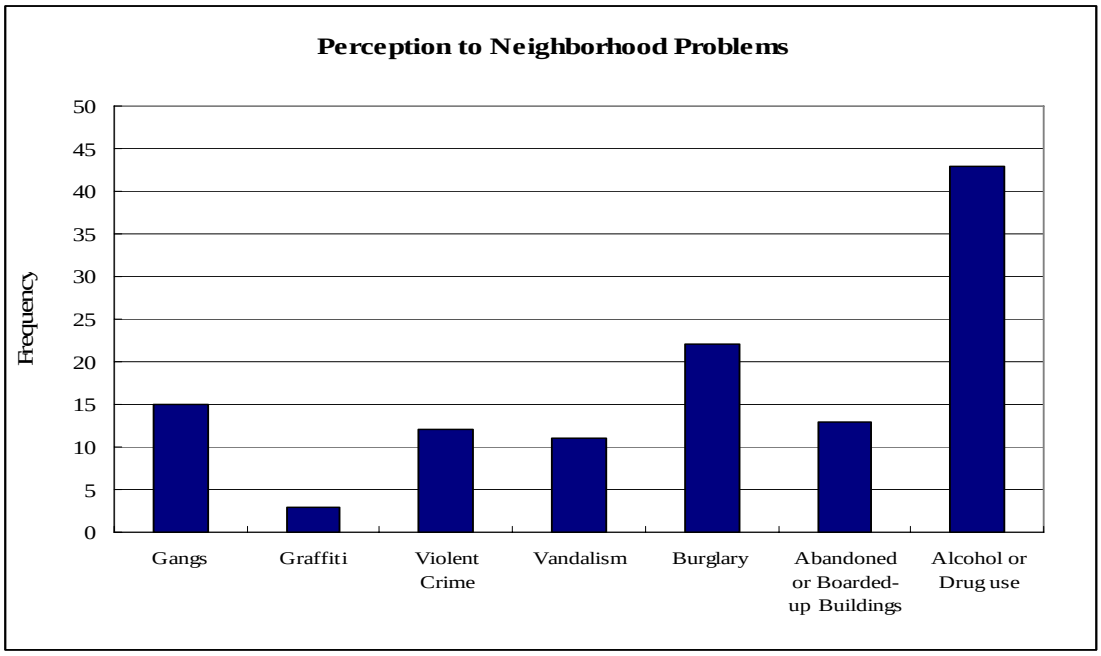


Figure 5-17 Responses to Perceived Neighborhood Problems

The total number of perceived neighborhood problems and the corresponding number of respondents are summarized in Table 5-17. A total of 38.8% of older African American women reported that they did not perceive any problems in their neighborhood. Among those who perceived problems in their neighborhood, 22.5% reported one problem, 16.3% two problems, and about 20% three or more problems.

Table 5-17

The Frequency of Neighborhood Problems

Number of Reported Problems	Number of Respondents (%) (N =79)
0	31 (38.8%)
1	18 (22.5%)
2	13 (16.3%)
3	5 (6.3%)
4	5 (6.3%)
5	4 (5.0%)
6	1 (1.3%)
7	2 (2.5%)

A factor analysis was conducted to check if there were clusters of perceived neighborhood problems, and the results are summarized in Table 5-18. The oblique rotation (promax) produced two factors: first factor was composed of graffiti, vandalism, and abandoned buildings ranging from .79 to .87, and the second was composed of gangs, violent crime, burglary, and alcohol or drug use ranging from .52 to .94. Although burglary was double loaded, it was included only in factor 2 in calculating the Cronbach's alpha, because the factor loading score was higher in factor 2 than in factor 1.

The correlation coefficient between the two factors was .47, indicating that the two factors were highly interrelated with each other.

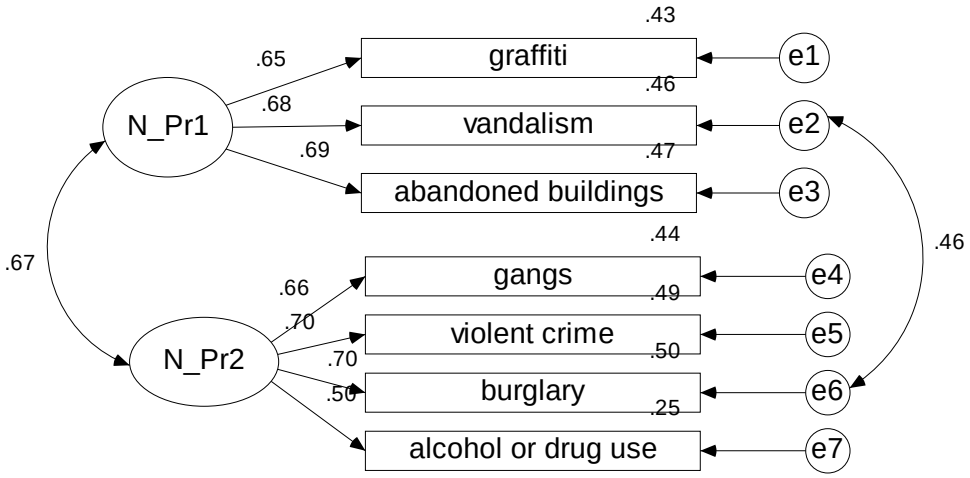
Table 5-18

Factor Loading and Reliability in Perceived Neighborhood Problems

	Factor 1: Abandonment-related Problems	Factor 2: Crime-related Problems
Gangs		.93
Graffiti	.79	
Violent Crime		.75
Vandalism	.87	
Burglary	.42	.52
Abandoned Or Boarded-Up Buildings	.80	
Alcohol or Drug Use		.65
Eigenvalues	3.23	1.45
Percentage of variance	46.10	16.37
Cronbach's alpha	.74	.70

Figure 5-18 shows the SEM measurement model of perceived neighborhood problems. As expected in the factor analysis, the two factors were positively interrelated to each other. The estimates of correlation were higher in the model (r =.67) than in the factor analysis (r=.47). The goodness-of-fit indices of the model were: χ^2 = 19.10, *p-value* = .09, CFI = .95, and RMSEA = .08, indicating a fair fit of the model.

Perceived Neighborhood Problems Model



Chi-square = 19.10 (*df* = 12), *p-value* = .09, CFI = .95, RMSEA = .08

Figure 5-18 SEM Measurement Model of Perceived Neighborhood Problems

Note: CFI = Comparative Fit Index, RMSEA = Root Mean Square Error of Approximation, N_Pr1: Abandonment-related Problems, N_Pr2: Crime-related Problems.

2) Perception of Crime Safety

Descriptive statistics of a total of five items of perception of crime safety are summarized in Table 5-19. Five items were rated with 5-points Likert-type scale representing from 1(strongly disgree) to 5(strongly agree). According to the mean value, older African American women somewhat agreed that they could see walkers and bikers easily in their neighborhood.

Respondents also presented somewhat positive expressions regarding to the questions regarding well lit streets and feeling safe during the day and in the evening. However, they somewhat disagreed about safety from crime in the neighborhood.

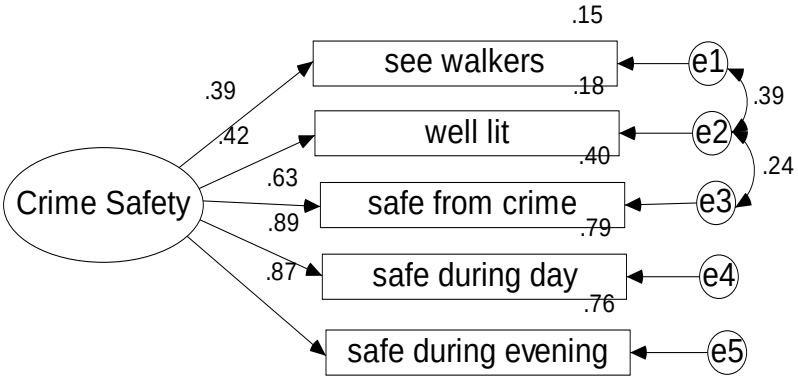
Table 5-19

Descriptive Statistics of Perception of Crime Safety

	Mean (SD)	Skewness	Kurtosis
Walkers and bikers on the streets in my neighborhood can be easily seen.	3.67 (1.25)	-.848	-.279
My neighborhood streets are well lit in the evening.	3.20 (1.36)	-.222	-1.323
My neighborhood is safe from crime.	2.65 (1.36)	.233	-1.273
I feel safe walking or jogging alone in my neighborhood during the day.	3.34 (1.40)	-.436	-1.154
I feel safe walking or jogging alone in my neighborhood in the evening.	2.99 (1.36)	-.103	-1.273

The promax factor analysis generated a single factor with eigen values of 2.84, explaining 56.7% of variance. The Cronbach's α of this single factor was .81. The results of the SEM measurement model presented in Figure 16 indicated a good overall fit of the model: $\chi^2 = 2.71$, *p-value* = .44, CFI = 1.00, and RMSEA = .00, indicating a fair fit of the model (See Figure 5-18).

SEM measurement model of Perceived Crime Safety



Chi-square = 2.71 (*df* = 3), *p-value* = .44, CFI = 1.00, RMSEA = .00

Figure 5-19 SEM Measurement Model of Perceived Crime Safety

Note: CFI = Comparative Fit Index, RMSEA = Root Mean Square Error of Approximation

4) Perception of Traffic Safety

Table 5-20 presents the mean, standard deviation, skewness and kurtosis of each statement tested in the section regarding perception of traffic safety. Based on the responses, the street environments of neighborhoods in which the study samples resided did not have much traffic and a relatively slow speed of traffic, and posted speed limits were somewhat well obeyed.

However, older African American women almost all strongly disagreed with the six statements regarding pedestrian environment. This could be interpreted to mean that the pedestrian environments in their neighborhoods were not adequately safe or convenient enough for them to walk.

Table 5-20

Descriptive Statistics of Items in the Perception of Traffic Safety

	Mean (SD)	Skewness	Kurtosis
There is so much traffic along the street I live on that it makes it difficult or unpleasant to walk in my neighborhood.	2.86 (1.43)	.089	-1.418
The speed of traffic on the street I live on is usually slow (30 mph or less) (I)	3.11 (1.42)	-.124	-1.407
Most drivers exceed the posted speed limits while driving in my neighborhood.	2.91 (1.31)	.100	-1.213
There are crosswalks to help walkers feel safe crossing busy streets in my neighborhood.	1.76 (1.24)	1.378	.577
There are pedestrian signals to help walkers feel safe crossing busy streets in my neighborhood.	1.61 (1.15)	1.919	2.750
There are sidewalks on most of the streets in my neighborhood.	1.78 (1.32)	1.398	.455
Most sidewalks on streets are well-connected in my neighborhood.	1.73 (1.28)	1.538	.939
The sidewalks in my neighborhood are well maintained (paved, even, and not a lot of cracks).	1.62 (1.11)	1.779	2.133
There are lawn buffer between street and the sidewalks along the street I live on that it makes me fell safe to walk in my neighborhood.	1.76 (1.20)	1.466	1.030

Note: The inversed scores were counted for the statements with (I)

The results of the oblique rotation factor analysis and the Cronbach's α of each factor are summarized in Table 5-21. The table showed that items were clearly divided into two factors: the pedestrian safety-related factor (Factor 1) and the street safety-related factor (Factor 2). All items were double loaded and any correlations across the two factors did not appear in the structure matrix. The values of the factor loading in Factor 1 ranged from .76 to .92, accounting for 48% of the total variance with 4.34 of the eigenvalues. Factor 2 was composed of questions regarding traffic volume, speed and obeying the posted speed limits, and its factor loadings ranged from .60 to .79, explaining 17.2 % of the total variance with 1.55 of the eigenvalues.

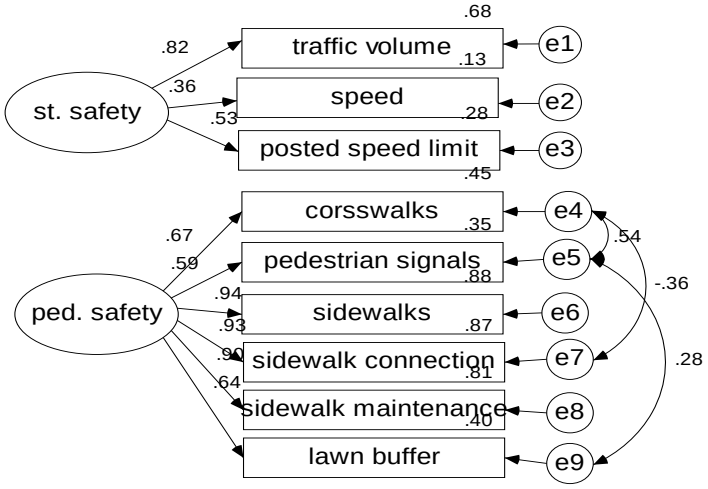
Table 5 -21

Factor Loadings and Reliability of Perception of Traffic Safety

	Factor 1: Pedestrian Safety-Related Factor	Factor 2: Street Safety-Related Factor
Traffic Volume		.788
Speed		.595
Posted Speed Limit		.755
Presence of Corsswalks	.831	
Pedestrian Signals	.797	
Presence of Sidewalks	.916	
Sidewalk Connection	.903	
Sidewalk Maintenance	.849	
Presence of lawn buffer	.755	
Eigenvalues	4.34	1.55
Percentage of Variance	48.17	17.20
Cronbach's Alpha	.92	.52

The Cronbach's α of Factor 1 was also considerably high with the value of .92, indicating high correlations between items, while the value of Cronbach's α in Factor 2 was a relatively low .52. The correlation coefficient between the two factors was .14, indicating a low or very little relationship between the factors.

The two-factor SEM measurement model was tested based on the factor analysis findings. Results showed that the SEM measurement model of the perception of traffic safety was composed of two stand-alone factors. The overall fit of the indices of this model were: χ^2 = 28.44, *p-value* = .24, CFI = .99, and RMSEA = .05(See Figure 5-20).



Chi-square = 28.44 (*df* = 24), *p-value* = .24, CFI = .99, RMSEA = .05

Figure 5-20 SEM Measurement Model of Perceived Traffic Safety

Note: CFI = Comparative Fit Index, RMSEA = Root Mean Square Error of Approximation, St. Safety: Street Safety-Related Factor, Ped. Safety: Pedestrian Safety-Related Factor.

5.3.4 Mediating Effects Between Physical Environments and Total Physical Activities

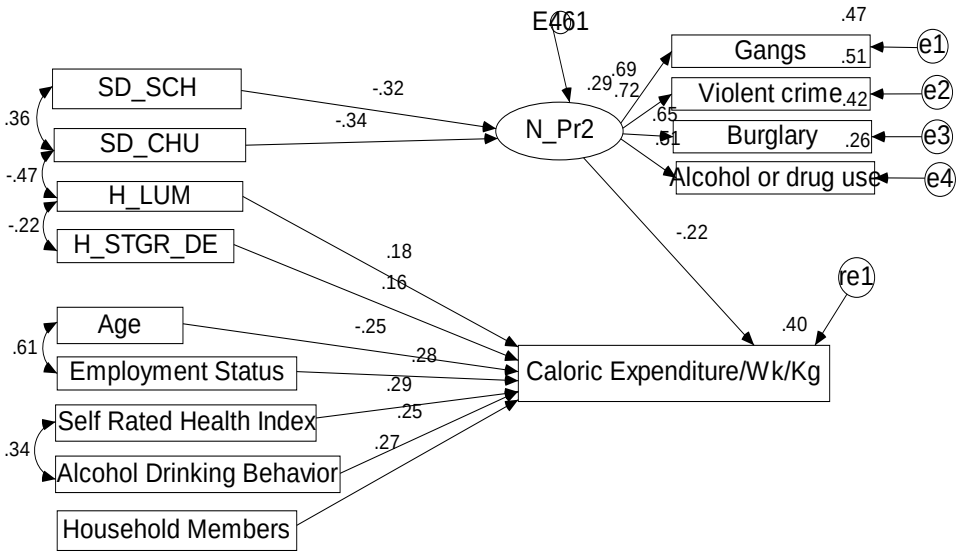
The effects of the five potential mediators (Psychological Well-being, Sense of Community, Perception of Neighborhood Problems, Perception of Crime Safety, and Perception of Traffic Safety) on the physical environmental variables and the level of total physical activity were examined by means of several structure equation models (SEM) using AMOS version 7.0. In the first sets of models, the mediating effects were tested at the nearby home level (0.5 mile street distance boundary) and the second sets of models examined the effects at the neighborhood level (1 mile street distance boundary).

1) The Mediating Effects Between Physical Environments at Nearby Home Levels and Total Physical Activities

At first, the five mediators were examined in the three models using three imputed datasets. However, all three models showed that only crime-related neighborhood problems had a mediating effect between the physical environmental variables and the total physical activities in nearby home environments (see Figure 5-21). . In all three final meditational models, paths were drawn from the street distance to the closest school and church to the crime-related neighborhood problems, and from the crime-related neighborhood problem areas to the total level of physical activity. Land-use mix and street greenery density had direct paths to total physical activity. The values of overall goodness-to-fit indices showed that two models (model 2 and 3) fit the data well, and model 1 was acceptable.

The squared multiple correlations (R^2_{smc}) of the three models were .40, .38 and .34, respectively. In other words, the street distance to the closest school and church, land-use mix, street greenery density, crime-related neighborhood problems, age, Self Rated Health Index, behavior regarding alcoholic drinks, household members, and employment status accounted for at least 34% of the variance in total physical activities among older African American women. Also, the squared multiple correlations (R^2_{smc}) of the crime-related neighborhood problems in three models were .29, .30, and .28.. In the given models, the street distance to the closest school and church explained about 28% of the variances in the crime-related neighborhood problems.

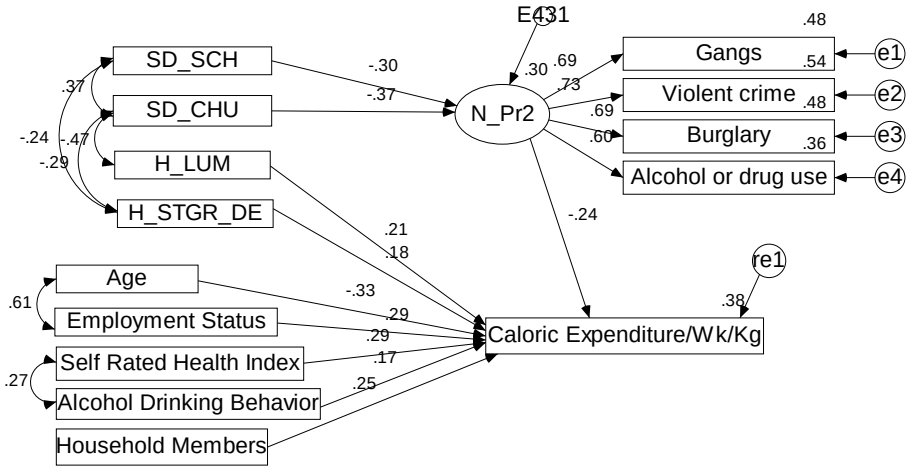
Model 1



Chi-square = 88.32 (df = 72), p =.09, CFI = .92, RMSEA = .05

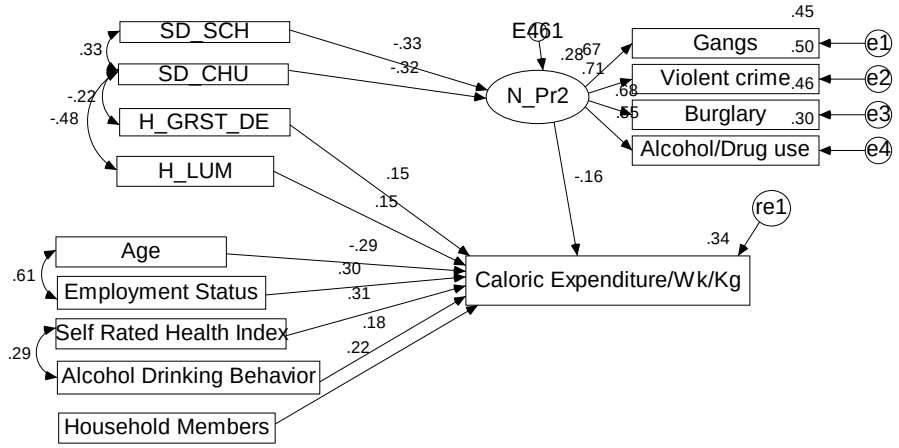
Figure 5-21 SEM Models Using Three Imputed Datasets in Nearby Home Level

Model 2



Chi-square = 85.45 (df = 71), *p* =.12, CFI = .93, RMSEA = .05

Model 3



Chi-square = 73.56 (df = 72), *p* =.43, CFI = .99, RMSEA = .02

Figure 5-21 Continued

Note: CFI = Comparative Fit Index, RMSEA = Root Mean Square Error of Approximation , SD_SCH: Street distance to the closest school, SD_CHU: Street distance to the closest church, H_LUM: Land Use Mix (Half Mile) , H_GRST_DE: Street Greenery Density (Half Mile), N_Pr2: Crime-related Problems

The combined path coefficients and standard errors of each parameter, as well as the *p-values*, are summarized in Table 5-22. In the given models above, it was revealed that when a school (B = -.31, p = .03) and a church (B = -.43, p <.01) were closer to a respondent's house, they perceived more crime-related neighborhood problems. And this increased perception of crime-related neighborhood problems led to not being engaged in physical activity (B = -1.39, p = .09). In addition, both land-use mix (B = 2.63, p = .07) and street greenery density (B = 8.61, p = .08) had a moderately positive influence directly on total physical activity.

Table 5-22

The Combined Path Coefficients Predicting Mediating Effects between Nearby Home Environmental Variables and Caloric Expenditure/week/kg in All Physical Activity

	Unstandardized Estimates	SE	T-ratio	*p-value*
To Perception to Neighborhood Problems				
Street Distant to the closest School	-.31	.14	-2.22	.03*
Street Distant to the closest Church	-.43	.16	-2.66	.01**
To Total Physical Activities				
Perception to Neighborhood Problems	-1.39	.81	-1.71	.09†
Landuse Mix	2.63	1.44	1.82	.07†
Street Greenery Density	8.61	4.91	1.76	.08†
Age	-.07	.03	-2.30	.02*
Employment Status	.60	.24	2.54	.01*
Household Members	.34	.13	2.60	.01*
Self Rated Health Index (SRHI)	.25	.08	3.06	.00**
Alcohol Drinks	1.18	.60	1.96	.06†

Note. †p < .10, * p < .05, ** p < .01

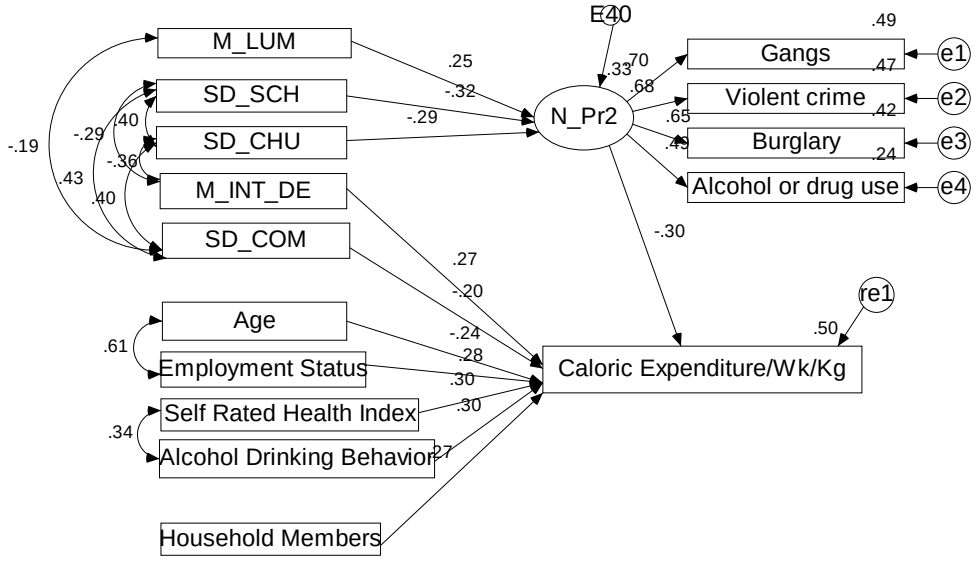
2) The Mediating Effects Between Physical Environments at the Neighborhood Level and Total Physical Activities

At the neighborhood environment level, only crime-related neighborhood problems were again left as a significant mediator between physical environmental variables and total physical activities in nearby home environments. According to Figure 5-22, in all three models, the same environmental variables appeared even though the value of the parameter estimates and fit indices varied.

The overall goodness-of-fit indices of all three models showed that the models fit the data well, with high values of CFI of 1.00 and low scores of RMSEA of .00. The squared multiple correlations (R^2_{smc}) of three of the models were .50, .45 and .42, respectively. In other words, these models accounted for at least 42% of the variance in total physical activities among older African American women.

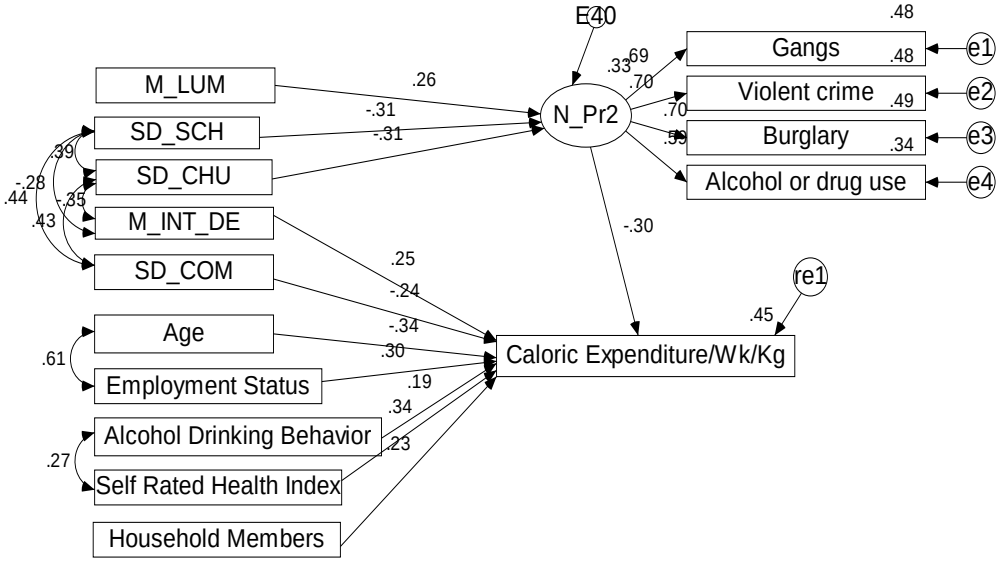
In the given model, the squared multiple correlations (R^2_{smc}) of the crime-related neighborhood problems were .33, .33 and .30, respectively. The squared multiple correlations (R^2_{smc}) of crime-related neighborhood problems were explained by three variables: land use mix density and the street distance to the closest school and church. In other words, land use mix density and the street distance to the closest school and church accounted for about 30% of the variances in the crime-related neighborhood problems.

Model 1



Chi-square = 81.14 (df = 82), *p* =.51, CFI = 1.00, RMSEA = .00

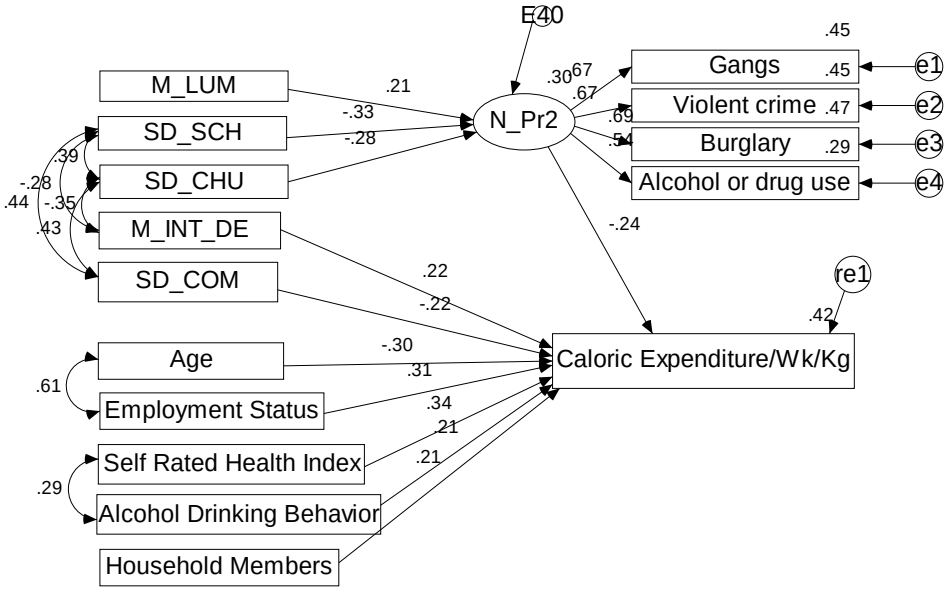
Model 2



Chi-square = 82.84 (df = 83), *p* =.48, CFI = 1.00, RMSEA = .00

Figure 5-22 SEM Models Using Three Imputed Datasets in Neighborhood Level

Model 3



Chi-square = 70.18 (df = 83), *p* =.84, CFI = 1.00, RMSEA = .00

Figure 5-22 Continued

Note: CFI = Comparative Fit Index, RMSEA = Root Mean Square Error of Approximation, M_LUM: Land Use Mix (One Mile), SD_SCH: Street distance to the closest school, SD_CHU: Street distance to the closest church, M_INT_DE: Intersection Density (One Mile), SD_COM: Street distance to the closest commercial land use, N_Pr2: Crime-related Problems

The combined path coefficients and standard errors of each parameter, as well as the *p-values,* are summarized in Table 5-23. Results revealed that the areas with more mixed land use (B = 1.18, *p* = .05) led to perceive more crime-related neighborhood problems. The distances to a school (B = -.31, *p* = .03) and a church (B = -.36, *p* =.02) were negatively associated with crime-related neighborhood problems, as they were in the model for nearby home environment. Again, when more crime-related neighborhood

problems were perceived, older African American women participated less in physical activity (B = -1.97, p = .02).

The pathway of intersection density (B = .39, p = .01) appeared to have positive effects on total physical activity. Also, total physical activity was increased when commercial land use (B = -1.21, p = .02) was closely located to respondents' houses.

Table 5-23

The Combined Path Coefficients Predicting Mediating Effects between Neighborhood Environmental Variables and Caloric Expenditure/week/kg in All Physical Activity

	Unstandardized Estimates	SE	T-ratio	*p-value*
To Perception to Neighborhood Problems				
Landuse Mix	1.18	.60	1.98	.05*
Street Distant to the closest School	-.31	.14	-2.24	.03*
Street Distant to the closest Church	-.36	.15	-2.34	.02*
To Total Physical Activities				
Perception to Neighborhood Problems	-1.97	.85	-2.33	.02*
Street Distant to the closest Commercial land use	-1.21	.51	-2.40	.02*
Intersection Density	.39	.14	2.67	.01**
Age	-.07	.03	-2.43	.02*
Employment Status	.64	.23	2.77	.01**
Household Members	.34	.13	2.56	.01*
Self Rated Health Index (SRHI)	.29	.08	3.47	.00***
Alcohol Drinks	1.44	.67	2.14	.05*

Note. †p < .10, * p < .05, ** p < .01, *** p < .001

CHAPTER VI

DISCUSSIONS AND CONCLUSIONS

6.1 Discussions

6.1.1 Total Physical Activity among Older African American Women and the Types of and the Places for Physical Activity

The primary purpose of this study was to examine the proportion of older African American women who meet national recommendations for physical activity and to explore the types and locations associated with physical activity.

1) Total Physical Activity

The general recommendations for Physical Activity advise participation in at least 30-minute of moderately intense activity at least five days a week. Jones et al. (1998) demonstrated that only 25.7% of African American women in the National Health Interview Survey (NHIS) data met the CDC-ACSM recommendation for physical activity. Compared to Jones at al. (1998), in this study, 49% of the study participants reported meeting the national recommendation for physical activity. In spite of considering that the CHAMPS is specially designed physical activity measure for older adults, unusually high proportions of older African American women were revealed to be engaged in physical activity. Possible reasons of differences might be age group difference between studies and the aggregated dwelling patterns of study subjects in the

sites. From the results, this study would suggest that physically active neighbors in small cohort types of neighborhoods might influence others' physical activity.

2) Types of Physical Activity

The most popular physical activities were walking (fast, leisure, and for errands), flexibility, conditioning exercises, light housework, and light gardening. As found in the previous research (Wilcox et al., 2003), as household type physical activity such as light housework (89%) and light gardening (50%) were highly prevalent to older women. Except household related physical activity, walking was one of the most commonly reported physical activities among older African American women. This is consistent with previous literature regarding older adults as well as general adult populations (Booth et al, 1997; Wilcox et al. 2003). Additionally, although the statistical significance was not reported, Adams-Campbell et al.(2000) provided the descriptive result that the mean of walking hours for exercise between age groups (21-39, 40-59, and 60-69 years) was gradually increased with age among African American women. Most results suggested that walking was not only popular physical activity regardless age and gender but also an appropriate type to be recommended as people gets older.

Although walking, flexibility, and conditioning exercises do not have clear guidelines to meet the ACSM/AHA recommendations for older adults, older African American women's participation in these types of physical activities promise, to an extent, to facilitate healthy aging. However, total percentages of those who are engaged in these three activities still remain low so that systemic programs promoting

participation in these activities by more older African American women should be required.

3) Places for Physical Activity

The common places for physical activity among older African American women were home/a friend's home/an apartment complex, streets, parks, churches, and work places. Older African American women participated in most types of physical activities at either their home or a friend's home, however, in the case of walking, several places such as streets, home/a friend's home/an apartment complex, parks, shopping malls, churches, and work places were frequently used. As popular places for walking, streets and parks have been found previously listed in the literature (Booth et al., 2000; Huston et al., 2003). Huston and colleagues (2003) reported that shopping mall and worship places were rarely used places for physical activity among most white general adult population. On the other hand, in this study, shopping malls and churches were also reported as popular places for physical activity. Results suggest that ethical and cultural approaches to promote physical activity should be considered. Also, it is expected that shopping malls might be relatively easily accessible cool places for older African American women without concerns about hot weather conditions, crime and traffic safety issues, and financial reasons.

The destinations to which older African American women frequently walked were analyzed for a separate purpose. The most popular destinations reached by walking were convenience/grocery stores, churches/places of worship, discount stores,

and schools. These frequently reported destinations are consistent with previous findings (King et al., 2003). King et al. (2003) found that more than 20% of older women walked to convenience/grocery stores, churches, and the post office at least once per month when they perceived that these destinations were located within a 20-minute walking distance. From this study, schools rather than a post office were revealed as a more important destination in older African American women's walking activity. This might due to different environmental contexts between site areas; that is, in study areas, several public schools were located within 1 mile distance from survey respondents but not a post office.

Considering that most of the African American women who participated in this study earned a low income (48% of the participants earned less than $20,000), it may be no wonder that they are more engaged in walking rather than any type of physical activity the involves a cost and use more streets and parks rather than paying for facilities (e.g. public recreation centers and gyms). Specific to older African American women's physical activity, the important role of churches should also be considered. In fact, about 98% of the participants claimed membership in a religion and they often walked to a church and used it for their physical activity as well. From the study results, to encourage older African American women to walk, street environments surrounding frequently visited destinations need to be safe. Also, as Bopp et al. (2007) suggested, if a physical activity program, especially aerobic exercise and strength training, which are strongly recommended by the ACSM/AHA, are combined with spiritual activities and

run by churches, it will also be a way to promote older African American women's physical activity.

6.1.2 The Effects of Objectively Measured Environmental Factors on Total Physical Activities of Older African American Women

A focus of this study was to examine the associations between objectively measured physical environments and older African American women's physical activity and to explore if influential environmental factors would differ depending on distance from home using two levels of environmental boundaries. Findings showed significant environmental effects in both the nearby home levels and the neighborhood levels with respect to increasing older women's physical activity, although they were associated with different environmental variables.

1) Distance Effects of Physical Environments

The direct effects of physical environmental variables on total physical activity showed different patterns in the two levels of the environment. At the nearby home environment (a 0.5 mile street distance boundary from the home), more greenery increased older women's physical activity while a larger percentage of intersections were associated with more frequent physical activity in older women in the neighborhood environment (a 1 mile street distance boundary from the home). The greenery density in the nearby home level and the intersection density in the neighborhood level accounted for at least 25% and 29% respectively of the variances in

total physical activity of older African American women considering their personal characteristics, i.e., age, employment status, household members, Self Rated Health Index (SRHI), and the behavior regarding alcohol drinks.

Greenery may be related with aesthetic values and weather condition. Findings suggest that providing greenery would be an important attractive addition to bring older African American women out in nearby surroundings in which hot weather lasts most of year. However, once they took steps to either get to a further destination or to take a walk for exercise, grid street patterns with more intersections encourage more physical activity among this older women group. The finding associated with intersection density is consistent with the studies that the more intersections combining with feeling of safer from traffic positively affects a senior's walking activity (Li et al., 2005) and the general adult population's physical activity. Although the positive effects of intersections were proven a various ranges from 0.5 mile to 1 mile distance form home, the repetition regarding intersection density should be considered an important factor in planning or designing communities that are expected to encourage physical activity and walking.

From the first set of results, it was found that study respondents frequently walked to convenience/grocery stores, churches/places of worship, discount stores, and schools. Hence, the street distance to the closest commercial land use, a church and a school, were tested to examine the associations between the distance of these places and respondents' physical activity. However, results showed no relationship between them. Also, King et al. (2005) found that a post office located within a 1500 meter street distance from an older women's home was positively associated with their physical

activity. However, in this study, walking to the post office was not tested since post office was reported by only a few older African American women

Despite a total of fourteen environmental variables that were examined, only one variable – greenery density (in both the nearby home level) and intersection density (in neighborhood level) was found respectively. One possibility that many environmental variables were not found as predictors to physical activity could be the homogeneity of the physical environment in which respondents resided. Indeed, due to the systemic selection of study samples and the aggregative dwelling tendency of African Americans, it was inevitable that environmental boundaries of respondents were highly overlapped, which resulted in physical environments with small variation.

2) Findings of Demographic Factors and Physical Health Status Related to Older African American Women's Physical Activity

In this study, among demographic factors, age, household members, and employment status were found to be associated with older African American women's physical activity. Although the age range of study samples was narrowed between 55 and 84 years old and the sample size was small, age were significantly negatively related to older African American women's participations in physical activity. The relations between age and physical activity have been found in several studies focusing on older adults (Wilcox et al., 2003; Booth et al., 2000, King et al., 2000) although this relation were not always found in studies with smaller sample size (Frank et al., 1998). Thus, the

study finding suggested that age might be the important determinant to physical activity among older African American women.

The numbers of household members were positively related with older African American women's physical activity. The relations between household members and physical activity have rarely been found whereas the effects of marital status, having children, and family supports on women's physical activity have been widely examined. Previous findings showed that living with spouse increased physical activity among African American women (Wilbur et al., 1998; Ransdell & Wells, 1998) while having children (King et al., 2000; Frank et al., 1998).and lack of family supports (Nies et al., 1999; Sharma et al., 2005; Walcott-McQuigg et al., 2001) were major barriers for African American women to be engaged in physical activity. In this study, the marital status showed no relation to physical activity, which is inconsistent with previous findings. Although the family structure (i.e., having children or not) was not included in the survey questionnaire in this study, the study results suggested that, the number of household members may influential components to facilitate older African American women's physical activity.

Study results showed that older African American women participated in more physical activity when they were either retired or not employed. This is consistent with the study of Reinli et al.(1996), however, other studies (Bild et al., 1993; King et al., 2000) did not show the relations between them.

In this study, the Self Rated Health Index was positively associated with physical activity, however, other studies (King et al., 2000; Ransdell, et al., 1998) showed that no

relations between perceived health rating and physical activity among African American women. Such results might be caused by either using different type of questionnaire or targeting on different age groups.

6.1.3 Mediating Effects of Perceived Neighborhood Problems between Physical Environments and the Total Physical Activities of Older African American Women

The purpose of this study was to examine whether or not plausible mediators exist between objectively measured physical environments and older African American women's physical activity in two different levels of the environment. The results showed that social and physical environments were significantly associated with older African American women's participations in physical activity. Initially, the mediating effects of psychological well-being, sense of community, perception of neighborhood problems, perception of safety from crime, and perception of traffic safety were tested. However, only the perception of neighborhood problems, especially crime-related problems, was found to be a significant mediator.

1) Distance Effects of Physical Environments

At the nearby home level, when participants resided closer to both the closest school and church, they perceive more crime-related neighborhood problems. Additionally, more mixed land use and more street greenery was directly associated with a greater amount of physical activity by older women. Results showed that the street distance to the closest school and church explained about 28% of the variances in the

crime-related neighborhood problems. The total model accounted for at least 34% of variance in total physical activity among older African American women with land use mix, street greenery, perception of neighborhood problems, and personal characteristics, i.e., age, Self Rated Health Index (SRHI), behavior regarding alcohol drinks, household members, and employment.

At the neighborhood level, more land use mix and closer street distance to both a school and a church increased the perception of crime-related neighborhood problems. Also, more intersections and closer street distance to commercial land use led to more participation in physical activity among older African American women. In this model, about 30% of the variance in crime-related neighborhood problems was explained by land use mix and the street distance to the closest school and church, and at least 42% of the variance in total physical activity among older African American women was explained by intersection density, the street distance to close commercial land use, perception of neighborhood problems, age, Self Rated Health Index (SRHI), behavior regarding use of alcohol, household members, and employment.

Findings showed that different physical environmental variables appeared to be associated with total physical activity in the two levels of environmental boundaries from home. That is, at the nearby home level, land use mix and street greenery were positively related to physical activity. However, in the neighborhood level, intersection density and the street distance to the closest commercial land use led to more physical activity while land use mix indirectly affected physical activity through the perception of neighborhood problems.

The results suggest important notions regarding the relationships between physical environment and physical activity. First, direct positive effect of mixed land use on older women's physical activity was shown within a 0.5 mile distance boundary while at the neighborhood level more mixed land use negatively affect physical activity through the perception of neighborhood problems. The positive relations between mixed land use and physical activity have been found in previous research (Frank & Pivo, 1994; Berrigan & Troiano, 2002; Kockelman, 1997). Study results show that the influences of mixture of land use differ depending on distance from home. One possible assumption regarding this result could be that, as specific characteristics of the site areas, dangerous areas with perceived neighborhood problems were included in the analysis for the neighborhood level, (1 mile street distance boundary), which may not be in the nearby home level. Also, the study results may suggest that more mixed land use providing multiple destinations in the nearby surroundings is more influential to stimulate older women's physical activity than in the further distance areas.

Second, the street distance to the closest commercial land use is related to physical activity in the neighborhood level, but not in the nearby home level. The importance of accessible store/convenience to promote physical activity has been noticed elsewhere (Wright et al., 1996; King et al., 2003). Also, in this study, grocery/convenience stores were a top destination for walking for older African American women, and the mean and standard deviations of the street distance to the closest commercial land use was $.37 \pm .34$ miles respectively. This clearly suggests that the closer the location of commercial land use to the older women helps to increase older

women's physical activity in the neighborhood level. However, it seems that once the commercial land use is located within a 0.5 mile street distance, it does not have a great effect on the variation of physical activity in older women.

Third, street greenery is an important factor in physical activity among older African American females in the nearby home level. This finding might be consistent with the notions made by Hawthorne (1989) and Wright et al (1996) who addressed the presence of trees (street trees), the availability of shade on hot days, and the shaded footpaths would encourage walking. Assuming that, among the listed 21 types of physical activity, their outdoor activities occurred on streets might be related to street greenery, it suggests that more street greenery encourages older women to walk, jog, and bike in the nearby home boundary. Also, the preference of the types of greenery (e.g. street trees, shrubs, or grass) should be examined in further study.

Finally, intersection density appears as a significant variable in the neighborhood level but not in the nearby home level. This result is inconsistent with Li and colleagues' study (2005) in terms of distance; that is, the effects of intersections combining with feeling of safer from traffic was shown in a 0.5 mile distance boundary. This suggests that street patterns in short distances do not have any significant relationship, but more intersections in larger areas increases physical activity among older African American women because street patterns with more intersections usually provide shorter walking distances.

2) The Effects of Perception to Crime-related Neighborhood Problems

Perception of neighborhood problems was found to have negative mediating effects between the street distance to the closest church and school and the total physical activity among older African American females in both levels of the environment. Although direct comparisons between this study and previous studies are not possible because of differences in the age groups, ethnicity, and size of cities, the negative relationship between perception of neighborhood problems and physical activity was found by Zenk et al. (2007), while Fisher et al. (2004) reported no relationship between them. In the study by Zenk et al. (2007), middle-aged African American women were study subjects, and in the case of Fisher et al. (2004), most participants were white females over the age of 64. This suggests that the cultural context of neighborhood environments in which most African American populations reside might be more correlated to perception of neighborhood problems rather than age differences. In addition, as the perception of neighborhood problems was not tested as a mediator in any earlier literatures, the study findings raised a new approach to examining the relations between actual environments, perceptions of neighborhood problems, and physical activity.

3) Locational Effects of Environmental Contexts

The correlation results showed that churches and schools were closely located, and the results of structural equation models showed that respondents who lived in closer distance to schools and churches perceived more crime-related neighborhood problems.

Based on the results, however, it might be difficult to determine whether schools and churches caused the crime-related problems, or whether the houses locating in closer distance to/from churches and schools were simply exposed to the frequent crime occurrence areas. The clear facts were that, first, two schools and several small churches were located in the study site in which older African American women reported to perceive more than three neighborhood problems (see Figure 6-1)., and, next, churches and schools were found to be popular places for physical activity as well as destinations for walking among older African American women. Therefore, findings suggested that the presence of neighborhood problems prevented the possibility of participating in physical activity by those who can frequently use or walk to churches and schools which are closely located to their homes. In addition, the possibility to the relations between violence and schools/churches in African American neighborhood might be examined.

The correlation table also showed that street greenery density was significantly negatively related to the street distance to the closest church, school and commercial area. That is to say, older women who lived in an environment with more greenery around the streets were, to an extent, shut away from neighborhood problems. This implied that the street greenery effect might be led by locational differences of the older African American women's homes. Hence, a study examining the effects of the density of street greenery on crime-related problems would be necessary in future study.

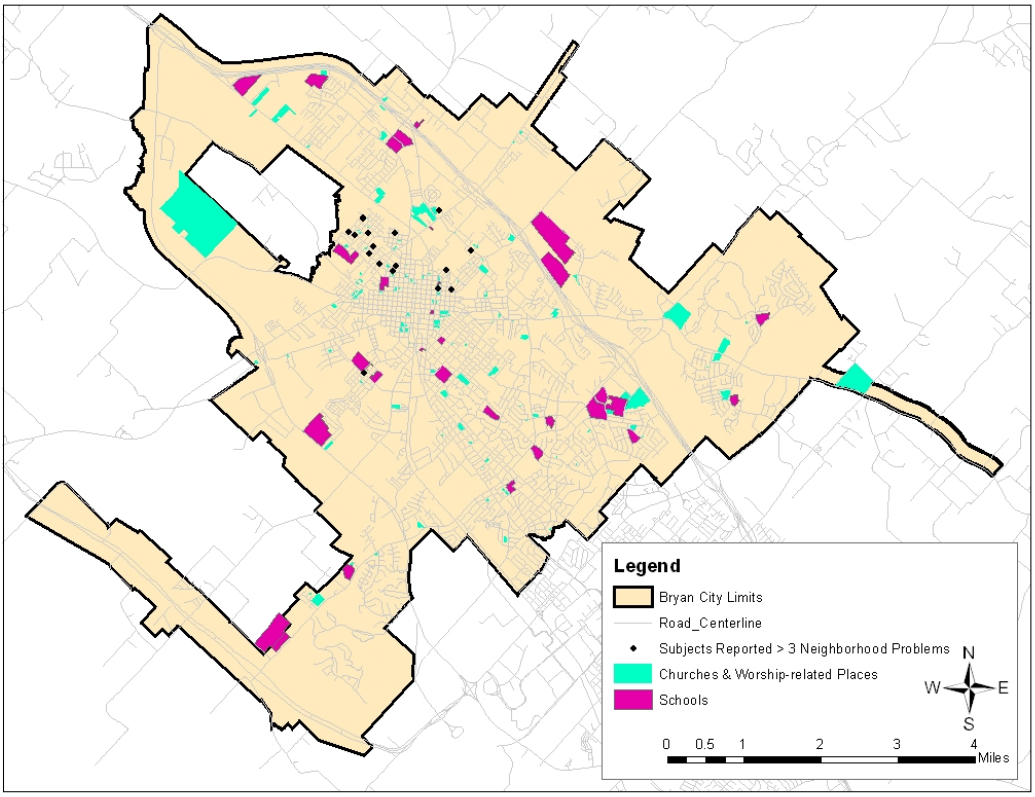


Figure 6-1 Locations of Respondents' Home who Reported to Perceive More than Three Neighborhood Problems and Locations of Churches and Schools

6.1.4 Differences between Actual and Perceived Environmental Effects

Study results showed that the differences did exist between the effects of actual and perceived environments on older women's physical activity. First of all, although the street distance to green open spaces, including parks and walking trails, was not significantly associated with older women's physical activity, the result is similar to King et al. (2005) who found that parks and walking/biking trails located in a 1500-meter street distance from an older women's home were not related to their physical activity.

Next, study results showed that total actual areas of green/open space were not related with older African American women's physical activity. However, several studies reported that respondents who perceived having access to natural facilities were engaged in more physical activity (Booth et al., 2000; King et al., 2003; Li et al., 2005). Although Li and colleagues (2005) also reported that total actual areas of green/open space were positively associated with older adult's physical activity, as the unit of analysis differed from mine, it might be inappropriate to compare the results.

Finally, sidewalk density was not associated with older women's physical activity in this study in this study. The finding was inconsistent with Li et al.(2005)'s study but again the unit of analysis could result in differences. On the other hand, several studies reported that perceiving the absence of sidewalks increased older adults' physical activity (Patterson & Chapman, 2004; Wilcox et al., 2003; Booth et al., 2000). In general, sidewalks are not equally constructed throughout entire neighborhood. For example, in the study areas, more sidewalks could be found in downtown areas in the level of arterials or collectors rather than local streets. This implies that previous findings could be made by self selection bias. Therefore, the effects of sidewalks on older adults' physical activity are needed to be more carefully examined.

6.1.5 Theoretical Support of Findings

In the beginning of the study, Press-Competence Model (Lawton & Nahemow,1973) and Ecological Models (McLeroy et al.,1988) were addressed to conceptualize the relations between environmental effects and older women's physical activity. Referring to the graph of the Press-Competence Model, when older women are assumed to have less competence than same age of men or younger people, it would be natural that their adaptive behavior (physical activity in this study) decreased under higher environmental press, which was the crime-related neighborhood problems in this study. Also, consistent with theoretical reviews of Ecological Models, participations in physical activity among older African American women were associated with social and actual (either natural or built) physical environments as well as sociodemographic and physical health characteristics. Findings suggested that the level of older women's physical activity would be apt to be affected by both social and physical environments.

6.2 Study Limitations

This study has a number of limitations. First, the systemic sample method may introduce a primary potential bias (Dillman 2000; Schutt, 2001). As discussed earlier, a person's ethnicity is not open to the public so the systemic sampling method, rather than random selection, was used to select those who live in the specific Census blocks representing over 80% of older African American women. In fact, a higher proportion of study samples selected by the systemic sampling lived in nearby downtown Bryan rather than spread throughout the whole Bryan area. As a result, the variation of environmental

variables was not large enough to test the diverse environmental effects on the level of total physical activity among older African American women.

Second, coverage error (Dillman 2000; Schutt, 2001) may occur as all older African American women are not registered voters. National data "Voting and Registration in the Election of November, 2004" shows that about 70% of African American aged over 45 was registered voters in South Region in the United States (U.S. Census Bureau, 2004). Besides, although five respondents recruited in churches lived in the selected Census blocks, their addresses were not included in voter registration data.

Third, a self-selection bias may occur between respondents and non-respondents (Leedy & Ormrod 2001, Gall et al., 2005). For example, when a survey questionnaire is mailed out to older African American women, those who decide to respond to the questionnaire may have a greater interest in their health, physical activity, or neighborhood environment than those who do not return a questionnaire. It is also possible that non-respondents may have more insights about participating in physical activity and in evaluating neighborhood environments in which they reside.

Fourth, the availability of GIS data and aerial photos can be another limitation of the study. In particular, when calculating greenery, the DOQ images that were used for classification allow only two layers – greenery or non-greenery. Therefore, although the total amount of greenery and the amount of street greenery were found to be important factors in increasing older African American women's physical activity, it is difficult to identify which type of greenery (e.g. trees, shrubs, or grass) has an essential impact on

their physical activity. In addition, the most recent data was obtained in 2006, which still does not exactly represent the current shapes of physical environments.

Finally, the design of this study is cross-sectional, the sample size is small, and the site is restricted to the city of Bryan. Hence, the results are associated with temporality, and also may be generalizable to the areas where the population, size, and weather are similar to the city of Bryan.

Although study have conducted with several limitations, sampling and coverage errors are expected to be overcome by approaching to African American women with their acquaintance. In fact, response rate of this study provided that hand-out distributions showed higher return rate than mailing out. Also, having interview with them may be useful way to obtain more plentiful their thoughts on physical environments as well as landscape preference.

6.3 Implication for Practice and Policy

From this study, it is evident that both social and physical environments influence the level of physical activity among older African American women. To promote physical activity among these African American women, it is important to understand their unique inclinations in social, cultural, and environmental preferences and apply this uniqueness along with generality to stimulate their active participation. It is expected that research results will be benefits for older African American women, neighborhood or community, practitioners, and policy makers.

First, this study shows evidence of a high engagement in walking and the frequent use of streets, parks, and churches for physical activity among older African American women. Considering that they used streets, parks, and churches extensively, identifying frequently used pedestrian pathways and providing more enjoyable specific routes could be helpful and practical ways to increase their physical activity. Also, in case of new developments, locating parks, churches, and schools within closer distance will be one way to lead to more seniors' participation in physical activity.

In the meantime, reducing or removing the crime-related neighborhood problems around the areas and building more churches and schools might be critical. Churches or religious institutions serve multiple important roles in the African American society. As shown in this study, 98% of respondents claimed membership in a religion and churches are used as places for physical activity as well as a frequent walking destination. Also, churches could be valuable places for incorporating physical activity interventions, especially for African Americans (Kreuter et al. 2003). Therefore, a policy of securing the surrounding areas of churches from crime and practical input from the community is needed.

6.4 Future Research

Future works are needed to develop a much more comprehensive mix of age groups and the mix of social, environmental, and psychological factors. First of all, investigating the gaps of perceptions to social and physical environments depending on age needs to be examined. Identifying the level of discrepancy among subpopulation

segments (e.g. adolescents, adults, older adults) would help to define most problematic environmental variables to each group as well as across entire population. Especially, the gaps regarding the level of perceived crime should be examined to improve the residential environments for older women.

Future studies are also need to examine the differences between perception and reality using actual crime and pedestrian data. Objective data is often used as a measure to make decisions. Comparisons actual data with perception would provide how much older women's perception to crime and traffic safety are related with actual data. This helps discover how much gaps exist between them.

In addition, detailing greenery into several levels (e.g. trees, shrubs, grass) using satellite photos and examining the effects of different level of greenery on physical activity will be important next study to determine the relations between the type of landscaping and physical activity.

6.5 Conclusion

As the importance of regular physical activity has become a concern for the older population, great efforts are underway to identify factors or variables that trigger a change from sedentary behavior to being physically active. In spite of several limitations, this study provided useful information to encourage older African American women to become more active within environmental settings in their neighborhood or community in suburban areas.

Findings suggested that outdoor environments were good sources for physical activity among older African American women. Actual physical environments were significantly associated with facilitating this physical activity. Also, perceived neighborhood problems were found to negatively mediate the effects of physical environments on older women's physical activity.

Therefore, the study suggested that to increase older African American women's physical activity, physical environments and neighborhood problems related to violent crime need to be considered and improved. In particular, a multilevel ecological approach such as establishing a kind of coalitions among institutions (e.g. program, leaders), community groups, and policy makers would be very useful not only to reduce neighborhood problems but also to promote participations in physical activity in systemic ways.

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APPENDIX A

DIFFERENCES BETWEEN TWO SURVEY GROUPS

1. Characteristics of the Sample

	Mail-out Survey Group (N = 63)	Hand-out Survey Group (N = 17)	Difference Between Groups(*p*)
Age	66.49 (7.40)	68.12 (10.39)	.47
Height(Inch)	64.75 (3.39)	64.18 (2.35)	.52
Weight(Pound)	192.84 (41.34)[c]	178.76 (42.75)	.22
Education			.06†
Less than high school	14 (22.2%)	4 (23.5%)	
High school/GED	24 (38.1%)	1 (5.9%)	
Community College/ Technical School	11 (17.5%)	4 (23.5%)	
College degree	3 (4.8%)	3 (17.6%)	
Graduate degree	10 (15.9%)	5 (29.4%)	
Marital State			.16
Married	17 (27.0%)	7 (41.2%)	
Common-law marriage/ living together	1(1.6%)	0	
Separated/divorced	17 (27.0%)	0	
Widowed	24 (38.1%)	8 (47.1%)	
Never married	4 (6.3%)	2 (11.8%)	
Employment State			.78
Full time	17 (27.0%)	4 (23.5%)	
Part time	7 (11.1%)	3 (17.6%)	
Not employed	8 (12.7%)	1 (5.9%)	
Retired	31 (49.2%)	9 (52.9%)	
Household Income			.42
Less than 20,000	32 (50.8%)	6 (35.3%)	
20,001-40,000	21 (33.3%)	5 (29.4%)	
40,001-60,000	6 (9.5%)	2 (11.8%)	
60,001-80,000	2 (3.2%)	2 (11.8%)	
Religion			
Yes	61 (96.8%)	14 (82.4%)	N/A
Car Ownership			.81
Yes	56 (88.9%)	13 (76.5%)	
No	7 (11.1%)	2 (11.8%)	
Household members	1.70 (1.28)	1.67 (1.45)	.92
Residence years	25.78 (15.99)	21.67 (15.88)	.37

2. Physical Health Status of the Sample

	Mail-out Survey Group (N = 63)	Hand-out Survey Group (N = 17)	Difference Between Groups(*p*)
Smoke			.77
Yes	9 (14.3%)	2 (11.8%)	
No	53 (84.1%)	15 (88.2%)	
Drink Alcohols/Week			.02*
None	55 (87.3%)	9 (52.9%)	
1-5 times	3 (4.8%)	6 (35.3%)	
Self Rated Health Index (SRHI)	8.89 (1.97)	9.12 (2.55)	.69
Health Behavior Index (HBI)	.010 (2.31)	-.035 (1.64)	.94
Health Conditions Index (HCI)	16.70 (1.98)	17.24 (2.22)	.34

3. Characteristics of Physical Activities

	Mail-out Survey Group (N = 63)	Hand-out Survey Group (N = 17)	Difference Between Groups(*p*)
Caloric Expenditure/week/kg in all exercise-related physical activities	4019.99(3437.99)	3866.28(3345.51)	.88
Caloric Expenditure/week/kg in moderate-intensity physical activities	1951.94(2762.29)	1441.52(1776.40)	.48
Frequency/week in all listed physical activities	14.38 (10.98)	12.86(10.80)	.64
Frequency/week in moderate-intensity physical activities	4.43 (5.95)	3.06 (4.22)	.38

4. Mediators

	Mail-out Survey Group (N = 63)	Hand-out Survey Group (N = 16)	Difference Between Groups(*p*)
Psychological Well-being	2.37 (1.18)	2.94 (.97)	.07†
Sense of Community			
Influence	2.44 (1.38)	2.94 (1.06)	.13
Emotional Connection	3.31 (.99)	3.25 (1.00)	.83
Membership	1.47 (.74)	1.06 (.85)	.06†
Perceptions of Neighborhood Problems	1.57 (1.76)	1.25 (1.95)	.53
Safety from Crime	3.13 (1.00)	3.31 (1.08)	.56
Perception to Traffic Safety	3.11 (1.02)	3.19 (1.02)	.80
Perception to Pedestrian Safety	1.61 (.97)	2.09 (1.12)	.09†

5. Characteristics of Physical Environments

	Mail-out Survey Group (N=63)	Hand-out Survey Group (N=17)	Difference Between Groups(*p*)
Half-mile			
Sidewalk Density	.49 (.18)	.59 (.36)	.27
Intersection Density	10.51 (2.35)	9.21 (2.50)	.05*
Cul-de-sac Density	1.74 (1.94)	1.46 (1.07)	.44
Street Density	.03 (.01)	.02 (.01)	.01**
Park/Green Area Density	.04 (.05)	.04 (.07)	.96
Number of accessible Park/Green Area	1.03 (.65)	.47 (.51)	.00***
Total Amount of Greenery	.46 (.05)	.48 (.10)	.53
Greenery on Street	.19 (.03)	.17 (.04)	.03*
Commercial Area Density	.03 (.04)	.10 (.11)	.04*
Land-Use Mix	.70 (.09)	.63 (.19)	.16
One-mile			
Sidewalk Density	.47 (.11)	.50 (.22)	.58
Intersection Density	10.22 (1.02)	9.46 (1.63)	.08†
Cul-de-sac Density	1.02 (.70)	1.63 (.75)	.00***
Street Density	.03 (.01)	.02 (.01)	.01**
Park/Green Area Density	.02 (.01)	.04 (.04)	.08†
Number of accessible Park/Green Area	3.41 (2.18)	1.88 (1.17)	.00***
Total Amount of Greenery	.48 (.06)	.52 (.06)	.06†
Greenery on Street	.16 (.03)	.14 (.02)	.01*
Commercial Area Density	.07 (.06)	.09 (.06)	.09†
Land-Use Mix	.77 (.05)	.76 (.08)	.81
Network Distance to the closest			
Park/Green Area	.32 (.18)	.53 (.35)	.03*
School	.55 (.40)	.36 (.28)	.07†
Church	.22 (.20)	.33 (.33)	.23
Commercial Area	.40 (.35)	.27 (.31)	.16

APPENDIX B

Date _____

Environmental Determinants for Older Women's Physical Activity Questionnaire

Texas A&M University
Dept. of Landscape Architecture and Urban Planning

Survey on the
Environmental Determinants for
Older Women's Physical Activity Questionnaire

- **Please complete and return this survey and you will receive a $5.00 GIFT CARD. To receive this gift card,**
  - **You should be a WOMAN AGED 55-84**
  - **Please make sure to fill out each question and return your completed survey <u>BY NOV. 30.</u>**
  - Please return your completed survey in the **provided business reply envelope**.
  - Please **select one gift card** that you want to receive:
    - ☐ **Walmart**
    - ☐ **H.E.B**
    - ☐ **Target**
    - ☐ **Starbucks**

- I am interested in how you feel about your neighborhood environment.
- Your responses are **anonymous** – your **name** will **never be connected with your answers.**
- **EVERY VOICE IS IMPORTANT!** Please take a few minutes and tell me about your participation in physical activity and your neighborhood.

[PART I]
Physical Activities

This questionnaire is about activities that you may have done in the **PAST 4 WEEKS.** The questions on the following pages are similar to the example shown below.

INSTRUCTIONS

1. **If you DID NOT do the activity → Circle the NO.**
2. **If you DID the activity in the PAST 4 WEEKS:**
   - **Step 1: Circle the YES.**
   - **Step 2: Think about how many TIMES a week you usually did it, and write your response.**
   - **Step 3: Circle how many TOTAL HOURS in a typical week you did the activity.**

Here is an EXAMPLE of how Mrs. Jones would answer question #1: Mrs. Jones usually jogs twice a week. She usually spends one hour on Monday on streets and two hours on Wednesday in parks. Therefore, the total that she jogs is 3 hours a week, and she jogs both on streets and in parks.

In a typical week during the past 4weeks, did you…

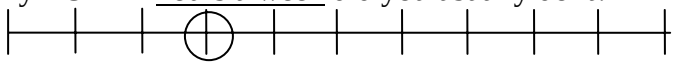
1-1. Jog or run ?

a. No

b. Yes,

→ How many TIMES a week? ___2__

→ How many TOTAL hours a week did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

1-2. If yes, where do you do this activity? Check as many as apply.

- ☒ On streets
- ☐ Walking/Jogging trails
- ☒ Parks
- ☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Lincoln/Neal Recreation Center, Travis Athletic Complex)
- ☐ Gym (e.g. Gold's Gym, Aerofit)
- ☐ Shopping Mall
- ☐ Church or at a place of worship
- ☐ Home

OTHERS(Specify)_____

In a typical week during the past 4weeks, did you…

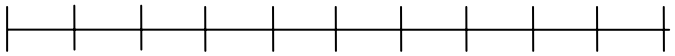
1-1. Walk fast or briskly for exercise (do not count walking leisurely)?

a. No

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more

1-2. If yes, where do you do this activity? Check as many as apply.

☐ On streets
☐ Walking/Jogging trails
☐ Parks
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Shopping Mall
☐ Church or at a place of worship
☐ Home
☐ Business or Job Office Complex

OTHERS(Specify)_____

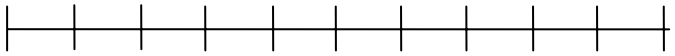
2-1. Walk leisurely for exercise or pleasure?

a. No

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



2-2. If yes, where do you do this activity? Check as many as apply.

☐ On streets
☐ Walking/Jogging trails
☐ Parks
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Shopping Mall
☐ Church or at a place of worship
☐ Home
☐ Business or Job Office Complex

OTHERS(Specify)_____

In a typical week during the past 4weeks, did you…

3-1. Walk to do errands (such as to/from a store or to take children to school; count walk time only)?

a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL hours a week did you usually do it?

0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

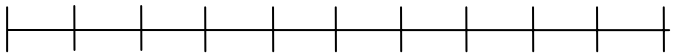
3-2. If yes, where do you do this activity? Check as many as apply.

- ☐ Elementary school
- ☐ Schools other than elementary schools
- ☐ Church or other religious institution
- ☐ Community center
- ☐ Convenience, deli, or grocery store
- ☐ Department, discount or hardware store
- ☐ Library
- ☐ Post office
- ☐ Restaurant, pub, or bar
- ☐ Café or coffee shop
- ☐ Bank
- ☐ Laundry/dry cleaners
- ☐ Pharmacy/drug store
- ☐ Salon
- ☐ Video store
- ☐ Your job

OTHERS(Specify)_____

4-1. Jog or run?

a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?



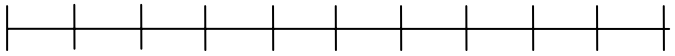
0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

4-2. If yes, where do you do this activity? Check as many as apply.

☐ On streets **0 1 2 3 4 5 6 7 8 9 10 & more (hrs)**
☐ Walking/Jogging trails
☐ Parks
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Home

OTHERS(Specify)_____

5-1. Ride a bicycle?
a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

5-2. If yes, where do you do this activity? Check as many as apply.

☐ On streets
☐ Walking/Jogging trails
☐ Biking paths/Biking trails
☐ Parks
☐ Biking paths/Biking trails in Parks
☐ Home

OTHERS(Specify)_____

In a typical week during the past 4weeks, did you…

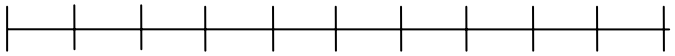
6-1. Ride a stationary cycle?

a. No

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL hours a week did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

6-2. If yes, where do you do activity? Check as many as apply.

☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Rehabilitation/Physical Therapy Center (e.g. St.Joseph Regional Rehab Center)
☐ Home

OTHERS(Specify)_____

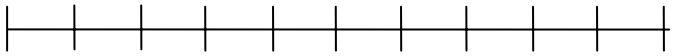
7-1. Dance (such as square, folk, line, ballroom) (do not count aerobic dance here)?

a. No

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL hours a week did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

7-2. If yes, where do you do this activity? Check as many as apply.

☐ Parks
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Dance Studio
☐ Night Club
☐ Church or at a place of worship
☐ Home

OTHERS(Specify)_____

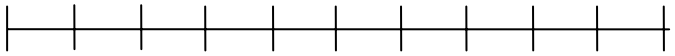
8-1. Play singles tennis (do not count doubles)?

a. No

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

8-2. If yes, where do you do this activity? Check as many as apply.

Tennis courts in Parks

☐

☐ Tennis courts in Schools

☐ Tennis courts in Apartment complex

☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)

☐

☐ Gym (e.g. Gold's Gym, Aerofit)

☐ Church or at a place of worship

☐ Home

OTHERS(Specify)_____

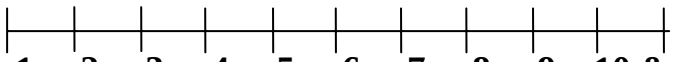
9-1. Play doubles tennis (do not count singles)?

a. No

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

9-2. If yes, where do you do this activity? Check as many as apply.

☐ Tennis courts in Parks

☐ Tennis courts in Schools

☐ Tennis courts in Apartment complex

☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)

☐ Gym (e.g. Gold's Gym, Aerofit)

☐ Church or at a place of worship

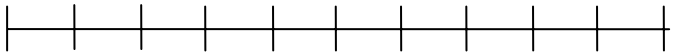
☐ Home

OTHERS(Specify)_____

In a typical week during the past 4weeks, did you…

10-1. Skate (ice, roller, in-line)?

a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?



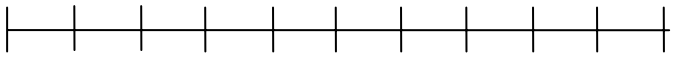
0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

10-2. If yes, where do you do this activity? Check as many as apply.

☐ On streets
☐ Walking/Jogging trails
☐ In-line hockey/Skateboarding in Parks
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Roller/Ice-skating Rink (e.g. Wolf pen skate, Arctic Wolf Ice Center)
☐ Church or at a place of worship
☐ Home
OTHERS(Specify)_____

11-1. Use other aerobic machines such as rowing, or step machines (do not count treadmill or stationary cycle)?

a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?



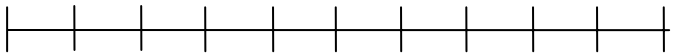
0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

11-2. If yes, where do you do this activity? Check as many as apply.

☐ Fitness center in Apartment complex
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Church or at a place of worship
☐ Home
OTHERS(Specify)_____

12-1. Do water exercises (e.g. aquatic aerobic) (do not count other swimming)?

a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?



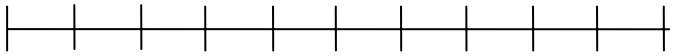
0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

12-2. If yes, where do you do this activity? Check as many as apply.

☐ Swimming pools in Parks
☐ Swimming pools in Schools
☐ Swimming pools in Apartment complex
☐ Public Recreation Center (e.g. Bryan Aquatic Center)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Rehabilitation/Physical Therapy Center (e.g. St.Joseph Regional Rehab Center)
☐ Church or at a place of worship
☐ Home
OTHERS(Specify)_____

13-1. Swim moderately or fast?

a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

13-2. If yes, where do you do this activity? Check as many as apply.

☐ Swimming pools in Parks
☐ Swimming pools in Schools
☐ Swimming pools in Apartment complex
☐ Public Recreation Center (e.g. Bryan Aquatic Center)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Rehabilitation/Physical Therapy Center (e.g. St.Joseph Regional Rehab Center)
☐ Church or at a place of worship
☐ Home
OTHERS(Specify)_____

In a typical week during the past 4weeks, did you…

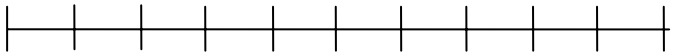
14-1. Swim gently?

a. No

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

14-2. If yes, where do you do this activity? Check as many as apply.

☐ Swimming pools in Parks
☐ Swimming pools in Schools
☐ Swimming pools in Apartment complex
☐ Public Recreation Center (e.g. Bryan Aquatic Center)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Rehabilitation/Physical Therapy Center (e.g. St.Joseph Regional Rehab Center)
☐ Church or at a place of worship
☐ Home

OTHERS(Specify)_____

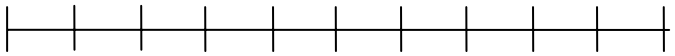
15-1. Do stretching or flexibility exercises (do not count yoga, Tai-chi or pilates)?

a. No

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

15-2. If yes, where do you do this activity? Check as many as apply.

☐ Fitness center in Apartment complex
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Dance Studio
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Rehabilitation/Physical Therapy Center (e.g. St.Joseph Regional Rehab Center)
☐ Church or at a place of worship
☐ Home

OTHERS(Specify)_____

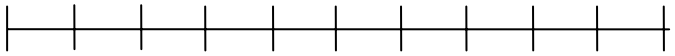
16-1. Do yoga or Tai-chi?

a. No

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

16-2. If yes, where do you do this activity? Check as many as apply.

☐ Fitness center in Apartment complex

☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)

☐ Dance Studio

☐ Gym (e.g. Gold's Gym, Aerofit)

☐ Rehabilitation/Physical Therapy Center (e.g. St.Joseph Regional Rehab Center)

☐ Church or at a place of worship

☐ Home/private home/friend's home

OTHERS(Specify)_____

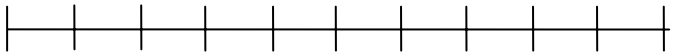
17-1. Do aerobics or aerobic dancing?

a. **No**

b. **Yes,**

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

17-2. If yes, where do you do this activity? Check as many as apply.

☐ Fitness center in Apartment complex

☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)

☐ Dance Studio

☐ Gym (e.g. Gold's Gym, Aerofit)

☐ Rehabilitation/Physical Therapy Center (e.g. St.Joseph Regional Rehab Center)

☐ Church or at a place of worship

☐ Home/private home/friend's home

OTHERS(Specify)_____

In a typical week during the past 4weeks, did you…

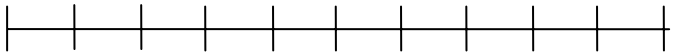
18-1. Do moderate to heavy strength training (such as hand-held weights of more than 5 lbs., weight machines, or push-ups)?

a. **No**

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

18-2. If yes, where do you do this activity? Check as many as apply.

☐ Fitness center in Apartment complex

☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)

☐ Dance Studio

☐ Gym (e.g. Gold's Gym, Aerofit)

☐ Church or at a place of worship

☐ Home

OTHERS(Specify)_____

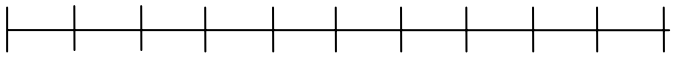
19-1. Do light strength training (such as hand-held weights of 5 lbs. or less or elastic bands)?

a. No

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

19-2. If yes, where do you do this activity? Check as many as apply.

☐ Fitness center in Apartment complex

☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)

☐ Gym (e.g. Gold's Gym, Aerofit)

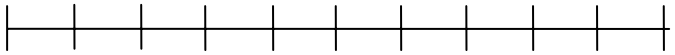
☐ Church or at a place of worship

☐ Home

OTHERS(Specify)_____

20-1. Do general conditioning exercises, such as light calisthenics or chair exercises (do not count strength training)?

a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

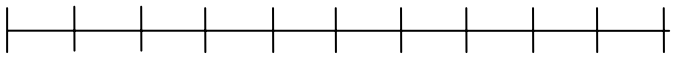
20-2. If yes, where do you do this activity? Check as many as apply.

☐ Fitness center in Apartment complex
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Church or at a place of worship
☐ Home

OTHERS(Specify)_____

21-1. Play basketball, soccer, volleyball or racquetball (do not count time on sidelines)?

a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

21-2. If yes, where do you do this activity? Check as many as apply.

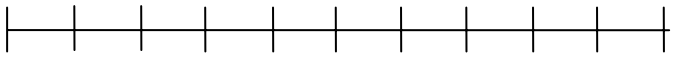
☐ Parks
☐ Apartment complex
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Church or at a place of worship
☐ Home

OTHERS(Specify)_____

In a typical week during the past 4weeks, did you…

22. Do heavy work around the house (such as washing windows, cleaning gutters)?

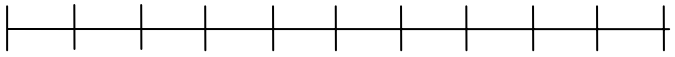
a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL hours a week did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

23. Do light work around the house (such as sweeping or vacuuming)?

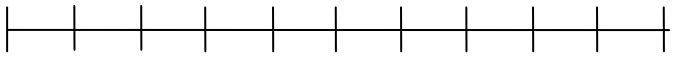
a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL hours a week did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

24-1. Do heavy gardening (such as spading, raking)?

a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL hours a week did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

24-2. If yes, where do you do this activity? Check as many as apply.

☐ Parks
☐ Church or at a place of worship
☐ Home

OTHERS(Specify)_____

25-1. Do light gardening (such as watering plants)?

a. **No**
b. **Yes,**
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?

0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

25-2. If yes, where do you do this activity? Check as many as apply.

☐ Parks
☐ Church or at a place of worship
☐ Home

OTHERS(Specify)_____

26-1. Work on your car, truck, lawn mower, or other machinery?

a. **No**
b. **Yes,**
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?

0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

26-2. If yes, where do you do this activity? Check as many as apply.

☐ Parks
☐ Church or at a place of worship
☐ Home

OTHERS(Specify)_____

In a typical week during the past 4weeks, did you…

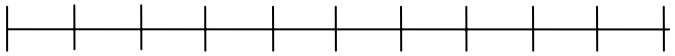
27-1. Play golf, carrying or pulling your equipment (count walking time only)?

a. No

b. Yes,

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

27-2. If yes, where do you do this activity? Check as many as apply.

☐ Golf course
☐ Golf practice facilities
☐ Parks
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Home

OTHERS(Specify)_____

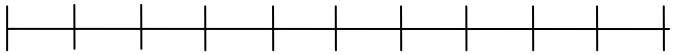
28-1. Play golf, riding a cart (count walking time only)?

a. **No**

b. **Yes,**

→ How many TIMES a week? _____

→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

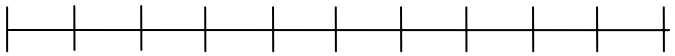
28-2. If yes, where do you do this activity? Check as many as apply.

☐ Golf course
☐ Golf practice facilities
☐ Parks
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Home

OTHERS(Specify)_____

29-1. Play disc(disk) golf?

a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

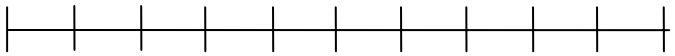
29-2. If yes, where do you do this activity? Check as many as apply.

☐ Disc golf course in Parks
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Home

OTHERS(Specify)_____

30-1. Play horseshoes?

a. No
b. Yes,
→ How many TIMES a week? _____
→ How many TOTAL <u>hours a week</u> did you usually do it?



0 1 2 3 4 5 6 7 8 9 10 & more (hrs)

30-2. If yes, where do you do this activity? Check as many as apply.

☐ Horseshoe pits in Parks
☐ Public Recreation Center (e.g. Bryan Regional Athletic Complex, Neal/Lincoln Recreation Center, Travis Athletic Complex)
☐ Gym (e.g. Gold's Gym, Aerofit)
☐ Home

OTHERS(Specify)_____

[PART II]

Crime & Traffic Safety in Neighborhood

Now, I would like to ask you some questions about the way that you perceive or think about your neighborhood.

A. Neighborhood Problems

Please select **ALL problems** that you think your neighborhood has.

- ☐ Gangs
- ☐ Graffiti
- ☐ Violent Crime
- ☐ Vandalism
- ☐ Burglary
- ☐ Abandoned or Boarded-up buildings
- ☐ Alcohol or drug use
- ☐ None of Above

B. Safety from crime

Please answer the following questions as they **BEST** apply to your neighborhood.

	strongly disagree	somewhat disagree	neither disagree/agree	somewhat agree	strongly agree
1. Walkers and bikers on the streets in my neighborhood can be easily seen.	1	2	3	4	5
2. My neighborhood streets are well lit in the evening.	1	2	3	4	5
3. My neighborhood is safe from crime.	1	2	3	4	5
4. I feel safe walking or jogging alone in my neighborhood during the day.	1	2	3	4	5
5. I feel safe walking or jogging alone in my neighborhood in the evening.	1	2	3	4	5

C. Traffic Safety in my neighborhood

Please answer the following questions as they **BEST** apply to your neighborhood.

	Strongly disagree	somewhat disagree	neither disagree/agree	Somewhat agree	Strongly agree
1. There is so much traffic along the street I live on that it makes it difficult or unpleasant to walk in my neighborhood.	1	2	3	4	5
2. The speed of traffic on the street I live on is usually slow (30 mph or less).	1	2	3	4	5
3. Most drivers exceed the posted speed limits while driving in my neighborhood.	1	2	3	4	5
4. There are crosswalks to help walkers feel safe crossing busy streets in my neighborhood.	1	2	3	4	5
5. There are pedestrian signals to help walkers feel safe crossing busy streets in my neighborhood.	1	2	3	4	5
6. There are sidewalks on most of the streets in my neighborhood.	1	2	3	4	5
7. Most sidewalks on streets are well-connected in my neighborhood.	1	2	3	4	5
8. The sidewalks in my neighborhood are well maintained (paved, even, and not a lot of cracks).	1	2	3	4	5
9. There are lawn buffer between street and the sidewalks along the street I live on that it makes me feel safe to walk in my neighborhood.	1	2	3	4	5

Sense of Community

Please tell me if it is mostly true or mostly false about your neighborhood simply by saying "true" or "false"

1. I think my neighborhood is a good place for me to live.	True	False
2. People in this neighborhood do not share the same values.	True	False
3. My neighbors and I want the same things from the neighborhood.	True	False
4. I can recognize most of the people who live in my neighborhood.	True	False
5. I feel at home in this neighborhood.	True	False
6. Very few of my neighbors know me.	True	False
7. I care about what my neighbors think of my actions.	True	False
8. I have no influence over what this neighborhood is like.	True	False
9. If there is a problem in this neighborhood people who live here can get it solved.	True	False
10. It is very important to me to live in this particular neighborhood.	True	False
11. People in this neighborhood generally don't get along with each other.	True	False
12. I expect to live in this neighborhood for a long time.	True	False

Psychological Well-Being

Now, I would like to ask you some questions about your feelings and daily life.
Please **CIRCLE** the answer that **BEST** applies to you.

1. Do things keep getting worse as you get older?	Yes	No
2. Do you have as much pep as you did last year?	Yes	No
3. How much do you feel lonely?	Not much	A lot
4. Do little things bother you more this year?	Yes	No
5. Do you see enough of your friends and relatives?	Yes	No
6. Do you feel that as you get older you are less useful?	Yes	No
7. Do you have a lot to be sad about?	Yes	No
8. Do you take things hard?	Yes	No
9. Do you get upset easily?	Yes	No

[PART III]

Physical Health Status

I would like to ask you some questions about your general health status. Please **CIRCLE** the answer that **BEST** applies to you.

1. How would you rate your overall health at the present time?
   a. Poor b. Fair c. Good d. Excellent

2. Is your health now better, about the same, or not as good as it was three years ago?
   a. Not as good b. Same c. Better

3. Do your health problems stand in the way of your doing the things you want to do?
   a. A great deal b. A little c. Not at all

4. Would you say that your health is better, about the same, or not as good as most people your age?
   a. Not as good b. Same c. Better

5. About how many times did you see any type of doctor during the past twelve months? Do not include doctors seen while you were a patient in hospital.
   _____Number of days

6. About how many days have you spent in a hospital during the past twelve months?
   _____Number of days

7. About how many days during the past twelve months have you been sick for all or most of the days?
   _____Number of days

8. How good is your eyesight (with glasses, if used)? Is it…
   a. Totally blind (legally blind) b. Poor (partially blind) c. Good or adequate

9. How good is your hearing? Is it …
   a. Totally deaf (legally deaf) b. Poor (partially deaf) c. Good or adequate

10. Do you smoke?
    a. Yes b. No

11. How many alcoholic drinks per week do you take?
    a. None b. 1 – 5 c. 6 or more

12. In the past year, have you (had)

	Yes	No
a. Diabetes or sugar sickness?		
b. High blood pressure or hypertension?		
c. Heart trouble?		
d. Any other effects of stroke?		
e. Angina pectoris?		
f. Arthritis, rheumatism?		
g. Emphysema or asthma?		
h. Chronic bronchitis?		
i. Osteoporosis?		
j. A tumor or growth, cancer?		
k. Liver trouble or jaundice?		
l. Fibromyalgia/chronic pain		
m. Myocardial infarction?		
n. A broken hip or other bones?		
o. Back problems?		
p. Anemia?		
q. Parkinson’s disease?		
r. Lung disease		
s. Other (specify)		

Background Information

I would like to ask you for some standard background information. This is an important part of the survey. Please check the box that **BEST** applies to you or write an answer.

1. Your Age: _____

2. Your Height: _____/ Your Weight: _____

3. Your race
   - ☐ White
   - ☐ African American
   - ☐ Hispanic
   - ☐ Asian
   - ☐ Other

4. Your Marital Status
   - ☐ Married
   - ☐ Common-law marriage/living together
   - ☐ Separated/divorced
   - ☐ Widowed
   - ☐ Never Married

5. Your education level
   - ☐ Less than high school
   - ☐ High school/GED
   - ☐ Community college/Technical school
   - ☐ College degree
   - ☐ Graduate degree

6. Your Employment Status
   - ☐ Full time
   - ☐ Part time
   - ☐ Not employed
   - ☐ Retired

7. Your Income level
   - ☐ Less than 20,000
   - ☐ 20,001-40,000
   - ☐ 40,001-60,000
   - ☐ 60,000-80,000
   - ☐ More than 80,000

8. Do you have a religion?
   a. Yes
   b. No

9. Do you own a car?
   a. Yes
   b. No

10. How many household members do you live with in your house?
    _____ person(s)

11. How long have you lived at your current address?
    _____year(s)

Would you like to tell me anything else about your neighborhood environments that encourage or discourage you to be engaged in physical activity?

If you would like to receive a $5.00 gift card, you must **return the competed survey in the provided envelope <u>BY NOV. 30.</u>** Please provide your **mailing address in the space below**. I will then send you the gift card by Jan. 10th 2008. **If you have any question about a gift card, please contact me at (979) 739 -8425.** Thank you.

Your Last Name: _____

Address: _____

Thank you very much for your participation.

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